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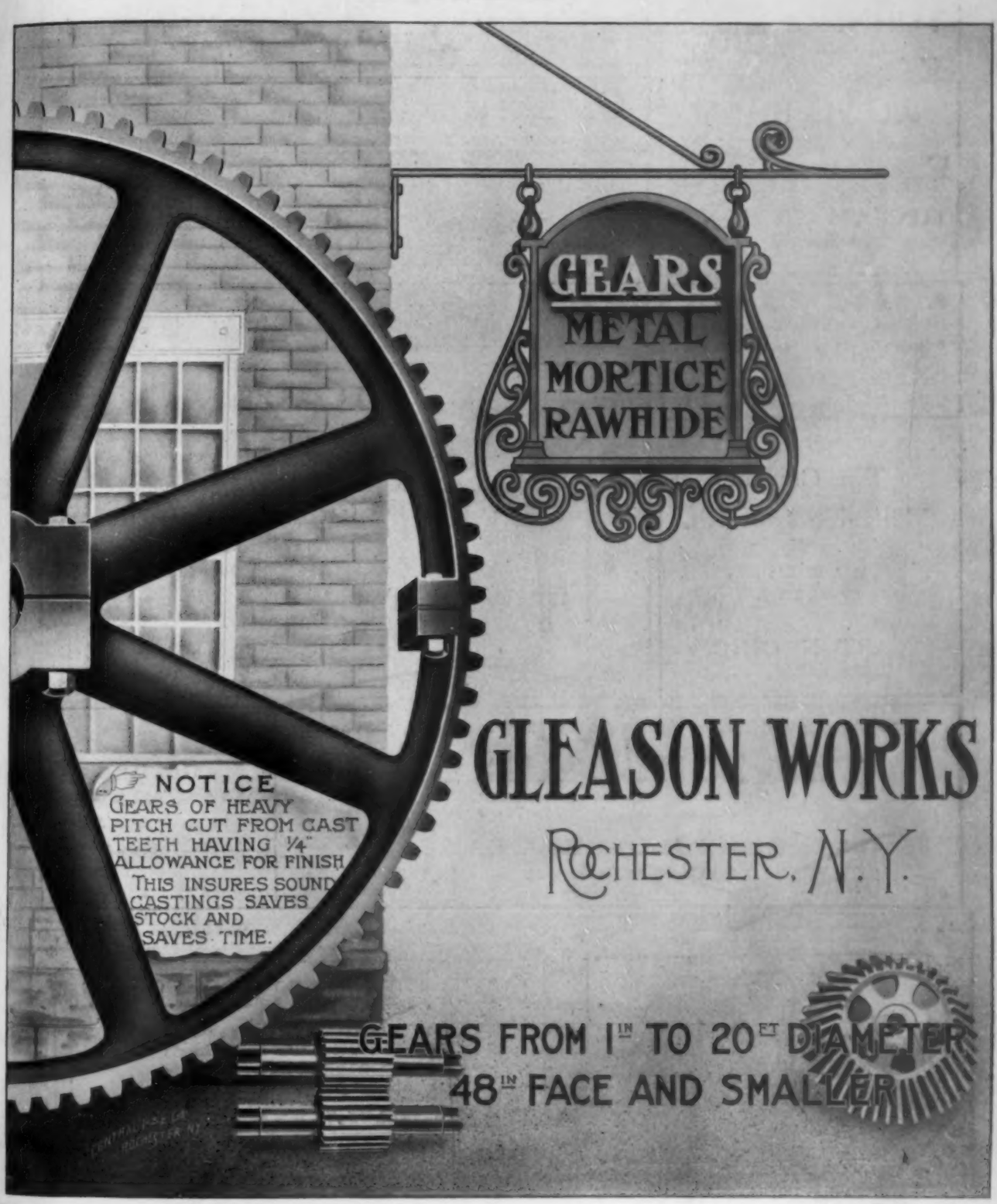
THE IRON TRADE REVIEW

A Weekly Journal Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

VOLUME XXXVII CLEVELAND, OHIO, JUNE 2, 1904 NUMBER 22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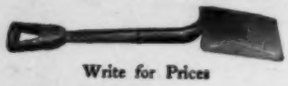
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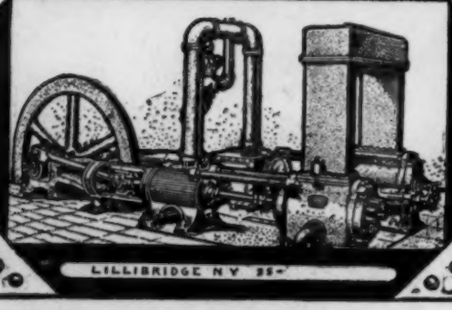
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THE IRON TRADE REVIEW

VOLUME XXXVII CLEVELAND, OHIO, JUNE 2, 1904 NUMBER 22

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Lower prices for pig iron and a number of finished products have come in the past week and the iron market gives distinct evidence of the shrinking of demand into narrower channels. There are signs of preparation for a quiet summer in the banking or blowing out of a number of blast furnaces in the Central West, the Chicago district and in Pennsylvania, though as yet the United States Steel Corporation has not participated in this movement apart from the stopping of several stacks of the Illinois Steel Co. There is no lack of ore in the yards of the Steel Corporation at South Chicago, but other furnaces in that district may have to curtail further if the lake strike lasts many weeks longer. The great majority of consumers of pig iron have no contracts beyond the middle of the year, and ordinarily a brisk buying movement would be under way. But only in exceptional cases, and these where large contracts have been undertaken by the foundries, as in the cast iron pipe trade, are buyers in the market. General business conditions have not changed for the worse. Crop prospects show improvement, according to official reports of the week, and the supply of money is abundant. But hesitancy is dominant in manufacturing operations, and the iron and metal-working trades seem to be adjusting themselves to a wait that may be prolonged over several months.

Reports from pig iron centers show that where any considerable business is inquired on new low prices come out. While $9.25, Birmingham, for Southern No. 2 iron is commonly the price, one or two large orders have been taken at $9. Though gray forge has been relatively scarce and for early delivery has been held firmly, $8 has been done on a good-sized order for the third quarter, while No. 3 and No. 4 foundry sold at $8.75 and $8.50 respectively. A 10,000-ton contract involving considerable amounts of Nos. 3 and 4 is reported from Cincinnati and a Northern Ohio pipe concern has inquired for 12,000 tons, of which 2,000 tons has been placed.

Chicago reports about 8,000 tons of bar iron sold at lower prices. Orders for 1,350 cars placed in that district account for most of the activity in bars. In the Pittsburg district a bar iron contract is reported at about $2 below the recent basis. In wrought pipe the outlook is excellent, gauged by the demand due to pipe line work, a 20,000-ton contract for Kansas being the latest development. It is understood that the year's program of the leading buyer will call for far more than the 100,000 tons originally contemplated. In merchant pipe close competition continues and a reduction of a point has been made in the past week. Wire and wire nails have a weakening tendency and the announcement of lower prices is looked for. Sheets are making new records and as low as 2.10c at mill for No. 28 was touched on an important contract in the past week.

Railroad buying could scarcely be more restricted when the heavy wear upon equipment is considered. The re-rolling rail mills are finding sharper competition from the heavy rail mills, which have been working up their seconds, and 25 to 40-pound rails have sold as low as $21.50.

April export returns show smaller totals than might have been expected in iron and steel, but summer shipments abroad will show an increase. The British iron market, which was reported improved a month ago, is again affected by American and German dumping, and demand seems to have fallen off.

Sacrifice sales of coke shipped on consignment have established record low prices in the week and curtailment in the coke regions seems inevitable.

The Chicago machinists' strike is growing and promises to become serious. The lake tie-up continues, with a fight to a finish accepted by both sides as inevitable. In the South the July 1st adjustment with the coal miners promises a clash that seems likely to cut down iron production for a time.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, }
429 PARK BUILDING, June 1. }

Demand for iron and steel products is decreasing, while lower prices on pig iron and a number of finished products prevail. The new tonnage placed with local mills during the week is smaller than for some time, but the orders on their books will carry them well through the present month, operating as at present. At Youngstown, the Republic Iron & Steel Co. resumed operations at its Bessemer plant this week, after an idleness of six days, sufficient business having accumulated during this period of idleness to insure operations for several weeks. The open-hearth furnaces of the Carnegie Steel Co. at South Sharon which were idle last week are again in operation, while a number of smaller mills in this district which were idle for a few days last week are on. With the increased falling off in tonnage the periods of idleness of these mills will increase and at the end of this month the output of raw and finished material will be greatly curtailed. The Republic Iron & Steel Co. has two furnaces banked, while McKeefrey & Co. will blow out their stack at Leetonia about the middle of this month. Four additional merchant stacks are also preparing to go out, and by July 1 the pig iron curtailment in the Mahoning and Shenango Valleys will amount to 35 or 40 percent of the present production. Steel Corporation furnaces throughout this territory continue to operate in full, and from present indications there is to be no curtailment until midsummer.

While current demand is dropping off, a number of large orders are being figured on. The Union Natural Gas Corporation, of this city, is in the market for 20,000 tons of line pipe for a gas line in Kansas. About 100 miles, or 10,000 tons, calls for 16-inch pipe, while the remainder of the tonnage is smaller sections of various sizes. Though the demand for line pipe is heavier than ever before in the history of the pipe trade, the competition on merchant pipe is keen, due both to the fact that most of the independent mills compete for this trade and to the off season. A new list, which reduces prices on all merchant sizes of steel pipe, except from 7 to 12 inches, by one point, is out today, but this does not meet the low prices which have been named by a few mills during the past few weeks. A reduced list on wire and wire nails is also expected by the trade in view of recent concessions. An extremely low price on bar iron was named this week on one order calling for 1,000 tons of assorted sizes which was closed a little above 1.30c. This will net the mill about 1.20c on or-

dinary sizes of common bar iron, which is quoted at 1.30c for ordinary lots. While considerable new work calling for large tonnages of structural material is being bid on, not much has been closed during the past ten days. The Wabash railroad has not yet placed the contract for its elevated tracks on the South Side, while a number of buildings for Baltimore have not been closed. The Pennsylvania Railroad Co. this week sent out specifications for bids on structural work on its Duquesne Way elevated tracks requiring 5,000 tons of steel, the bids to be opened on June 13. With the reorganization of the Consolidated Lake Superior Co., details relating to the placing of an order of 50,000 tons of Bessemer iron were adjusted, and shipments on the iron will begin at once. The contract for 75,000 tons of coke has not yet been let. The Wheeling Mold & Foundry Co. has not yet bought iron to cover its 32,000 tons of Pennsylvania tunnel castings, and it will be some time before this contract is finally closed, for the reason that a hitch has occurred over the contract specifications with reference to inspection.

The coke market is in a very unsettled condition, and both furnace and foundry grades have sold during the week at exceedingly low prices. A number of producers in the Connellsville region have been shipping coke during the past month to Chicago and Buffalo on consignment, and the congestion of coke at these points has resulted in extremely low prices. The sale of 25 cars of coke at Chicago netted the producer 40 cents a ton, while other consignments at this point and Buffalo netted 65 and 80 cents. Ovens in both the upper and lower regions are now being shut down and the production will be greatly curtailed in the next two weeks. On current business the producers are quoting from $1.45 to $1.60 for furnace, and $1.85 to $2 for foundry.

Light rails, 25 to 40 pound sections, are selling at $21.50 at the mill, and lighter sections at $23 to $24. The low price on the 25 to 40-pound sections is due to the competition of the Edgar Thomson rail mill. The re-rolling rail mills are still attempting to perfect an agreement by which each mill will be limited to a certain stipulated territory in which to sell its product, and a central purchasing agency is to be established to purchase the rails for all the mills so that the cost to each will be uniform. It is doubtful, however, if these policies can be carried out.

The first of the conferences between the Amalgamated Association and the manufacturers for the adjustment of the 1904-5 wage scale will be held on Tuesday, June 7, with the bar iron manufacturers.

Pig Iron.—Northern No. 2 is being freely offered at $13 Pittsburg, and on a desirable order $12.85 can be readily done. Gray forge is quoted at $12.75, but this can be shaded 25 cents a ton. One local concern last week purchased 1,700 tons of foundry and forge iron for delivery outside of this district. The iron is for delivery during June and July, the No. 2 foundry being placed close to $9 Birmingham, while the forge went at a trifle below $8.25 at the Southern furnace. For June delivery, Southern furnaces are now freely quoting $9.25 Birmingham, and $9 could be done on a desirable tonnage. Owing to the heavy demand for forge iron on the part of the cast iron pipe interests, this grade is stronger than the foundry irons, and while it might be possible to do $8 Birmingham, the prevailing quotation is $8.25. There is no demand for steel-making irons and quotations continue merely nominal at $12 to $12.15 Valley furnace. During the present month pig iron production in the Valleys will be curtailed from 35 to 40 percent, although no formal action to curtail output has been taken, nor will any be taken. We revise quotations as follows:

Bessemer, Valley	$12 15 to 12 25
Bessemer, Pittsburg	13 00 to 13 10
No. 1 Foundry	13 25 to 13 50
No. 2 Foundry	12 85 to 13 00
Gray forge, Pittsburg	12 50 to 12 75
Chilled basic, Valley	12 00 to 12 15
Chilled basic, Pittsburg	12 85 to 13 00

Steel.—A limited tonnage of billets and sheet bars is being closed locally at prices from $1 to $1.50 below agreed quotations. The amount of business that is offered is not great enough to induce the larger mills to name lower prices. Agreed quotations are as follows: Bessemer and open-hearth billets, 4 x 4 inches, and slabs up to and including 0.25 carbon, $23 Pittsburg, Wheeling, Valley, Johnstown, Ashland, Ky., Ironton, O., and Lorain, O.; 0.26 and including 0.60 carbon, $1 advance; and 0.61 to 1.00 carbon, $2 advance. Billets smaller than 3⅞ inches and sheets and tin bars are $1 per ton extra. Bessemer and open-hearth rods are still quoted at $30 to $31 Pittsburg.

Ferro-Manganese.—Domestic ferro, 80 percent, is held at $41.50 to $42.50, according to quantity, delivered at any point east of the Mississippi.

Skelp.—Skelp mills are receiving little new business and the market is weaker. Steel skelp, grooved and sheared, is held at 1.35c to 1.40c, and grooved iron 1.45c, while sheared is held at 1.47½c to 1.50c.

Muck Bar.—There is little demand for muck iron. Neutral bars are held at $25 to $25.50 at mill, Pittsburg.

Rails and Track Material.—Light rails, 25 to 40 pound sections, are now selling at $21.50 at mill Pittsburg. In comparison with the selling price of standard sections it would seem that the railroads are paying exorbitant prices. This, however, is not the case. These lighter sections are rolled from seconds, which if not re-rolled thus would have to be used as scrap and at present prices would be worth from $11.50 to $12 to the mill. By re-rolling seconds and selling them at the low prices quoted, the mill finds a more profitable method of disposing of its rejected sections. Sixteen to 25 pound sections are selling at prices ranging from $23 to $24. Despite these low prices little new business is being placed. New tonnage in standard sections is also light. We revise quotations as follows: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 16 to 25 pounds, $23 to $24; 25 to 40 pounds, $21.50 to $22. Track material: Spikes, 1.65c to 1.70c.

Plates.—Quotations on plates, narrow widths, are being shaded from $2 to $3 per ton. Wide plates, however, continue to sell at agreed prices, and while concessions are reported, they are given little credence by the trade. The market generally continues quiet. We make the following quotations: Tank plates, ¼ inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.85c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 10 inches, 5c extra 100 pounds. Plates 3-16 inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

Bars.—An order for 1,000 tons of iron bars, placed this week, was closed at close to 1.30c Pittsburg, for assorted sizes. This price netted the mill about 1.20c on common bars taking no extras. Current demand for both iron and steel bars continues light, while specifications on existing contracts are by no means heavy. We quote: Bar iron, 1.30c to 1.35c Pittsburg, for local delivery, while for Western shipment quotations are based on 1.25c to 1.30c Pittsburg. Hoops are held at 1.40c base, and bands at 1.35c taking bar extras. Bessemer steel bars, 1.35c; open-hearth, 1.40c; plow beams and cultivator beams, 1.35c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.45c. The following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance.

Structural Material.—The Pennsylvania Railroad Co. is asking for bids on the structural work on its Duquesne Way elevated track. The construction of this elevated road will require 5,000 tons of steel. Bids will be opened on June 13. The Wabash has not yet closed for its South Side elevated tracks, requiring about 5,000 tons. We quote as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles, from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Pipes and Tubes.—The Union Natural Gas Corporation, of this city, will shortly close for about 20,000 tons of line pipe for a gas line to extend from Independence, Kan., to Joplin and Kansas City. The demand for line pipe for gas and oil lines is heavier this year than ever before in the history of the pipe trade. On steel merchant pipe competition is keen and prices on all sizes, except 7 to 12 inches, have been reduced

one point. Discounts to consumers, carload lots f. o. b. Pittsburg, plus freight to destination according to Tube Rate Book, are revised as follows:

MERCHANT PIPE.

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛, ¼, ⅜ inch	69	59	66	56
½ inch	72	62	69	59
¾ to 6 inch	76	66	73	63
7 to 12 inch	71	61	68	58
Ex. stg., plain ends, ⅛ to 8 in.	68	58	64	54
Double ex. stg., pl. ends, ½ to 8 in.	60	50	56	46

BOILER TUBES.

	Steel.	Iron.
1 to 1½ inch	42½	39
1¾ to 2¼ inch	55½	38
2½ inch	58	43
2¾ to 5 inch	64½	50½
6 to 13 inch	55½	38

Sheets.—Demand for sheets is light and low prices continue to rule. Prevailing quotations are now on a 2.20c basis for 28 gauge, but no concessions below this are being named. Black sheets, one pass, in carload lots, are held as follows: No. 8, 1.75c; No. 9, 1.80c; Nos. 12-14, 1.90c; Nos. 15-17, 1.95c; Nos. 18-21, 2c; Nos. 22-24, 2.05c; Nos. 25-26, 2.10c; No. 27, 2.15c; No. 28, 2.20c; No. 29, 2.50c to 2.55c; No. 30, 2.60c to 2.65c. Galvanized: Nos. 12-17, 2.35c; Nos. 18-21, 2.50c; Nos. 22-24, 2.65c; Nos. 25-26, 2.85c; No. 27, 3c; No. 28, 3.20c; No. 29, 3.60c; No. 30, 4c.

Wire and Wire Nails.—A new list on wire and wire nails is now looked for by the trade carrying a reduction of $1 a ton. Concessions on delivered prices from 40 to 60 cents a ton are being made. We make the following quotations: Wire nails, carload lots to jobbers f. o. b. cars Pittsburg, are quoted $1.90 base; plain wire, carload lots, $1.80 base; barb wire, carload lots, $2.20 base; staples, carload lots, $2.05 keg. Galvanized, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel and iron cut nails, carload lots, $1.75, and less than carload lots, $1.80 f. o. b. Pittsburg, plus freight to points of destination. Terms, 60 days, less 2 percent off in 10 days.

Merchant Steel.—The market continues quiet, current demand being light. We make the following quotations: Toe calk, 1.90c; carriage spring steel, 1.75c; tire steel, 1.65c; plow steel, 6 inches and under, 1.40c for Bessemer and 1.40c for open-hearth; plow slabs, ¼ inch and heavier, 1.65c. The demand for shafting on the part of the machinery manufacturers is not heavy, and tonnage has therefore been considerably affected. Drawn and cold rolled shafting is held at 52 percent off in carload lots and 47 off in less than carloads.

Old Material.—We note the sale of 200 tons of heavy melting stock at $11.50 Pittsburg, for delivery during June. Cast scrap is held at $11 to $11.25, but there is little demand. No. 1 wrought scrap is quoted at $13.25 to $13.50, but the iron mills are not buying. Re-rolling rails are held at $13. At present this is largely a dealers' market, as there is little buying on the part of the mills and the dealers are picking up bargains and stocking them in their yards until the demand improves.

Coke.—The shipment of trainloads of coke to Chicago and Buffalo on consignment has resulted in heavy losses to the coke producers and as a result a large number of ovens are being shut down. At Chicago consignment coke has sold as low as 40 cents a ton during the week and numerous sales were made at 65 and 80 cents, the buyer of course paying the freight and demurrage charges. On contracts and current business $1.45 to $1.60 is quoted on furnace coke and $1.85 to $2 on foundry. For the week ending Saturday, May 21, the production of the upper region amounted to 210,795 tons and that of the lower Connellsville region, 55,078 tons.

CHICAGO.

(Special Telegram.)

CHICAGO, June 1.—The Iroquois Iron Co. has been forced to bank one of its furnaces at South Chicago, for the purpose of eking out its ore supply during the strike on the lakes. This is the only stack in this district that has been affected so far by the tie-up of the vessels in the ore transportation trade, although it is said if the strike continues much longer, other plants will be seriously affected. The Iroquois Iron Co. however has enough pig iron stored in its yards, as well as ore on hand, to fill all the orders on its books, and to take care of all the business which it expects to close in the next two or three months. None of the Illinois Steel Co.'s five idle furnaces were put out of blast because of any shortage in the company's ore supply. The two stacks at Bridgeport have been idle all year for relining, and two of the ten furnaces at South Chicago were put out of blast some weeks ago for repairs, while one furnace at the North Works in this city is always idle. The three furnaces at Joliet are working, as well as the two at Milwaukee. The International Harvester Co. has had one of its furnaces out for several weeks for relining. The company reports it has an ample ore supply on hand, and that it anticipates starting up this furnace June 6 in conjunction with the steel works.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, May 31.

Generally speaking the local market is in the quiet condition noted a week ago. In some departments of finished material, a slight improvement is noticeable in specifications, but new business is almost at a standstill. Iron and steel bars and structural steel have fared best in the week, some mills having received a good volume of specifications for these products The new business in bars comes largely from railroads or manufacturers of railroad equipment, the Northern Pacific having let contracts the past week for 850 box cars and the Seaboard Air Line for 500 box cars to the Western Steel Car & Foundry Co., of this city. This concern has placed its orders for bar iron, estimated at about 5,000 tons, closing the same at 1.35c Chicago. The specifications for steel were largely from implement manufacturers who have shown renewed activity during the week. Sheets remain ragged and though the market is much steadier under the new schedule, prices have a fluctuating tendency. Billets are also dull and there are few buyers despite the offers at prices below the association schedule. The movement of iron and steel from jobbers' warehouses has been hampered during the past week by a strike which called out the employes of various local dealers. The matter is still unsettled, though the places of those who left their work are being rapidly filled. The situation with regard to pig iron is unchanged. Southern iron is still held at $9.25 Birmingham for No. 2, and Northern grades at $13.50 Chicago for No. 2. Demand is limited to carload lots, and so long as it continues as such it is not believed there will be any further recessions. The machinists' strike in Chicago, as well as the tie-up on the lakes, and the possibilities of a strike among the miners in Alabama and Tennessee when the operators and union officials meet in July to discuss the proposed changes in the scale for the coming year, have contributed to the disposition on the part of both producers and consumers to obligate themselves with as little tonnage as possible until the outlook is clearer.

Pig Iron.—The market has no distinguishing feature other than that of one of extreme dullness. Melters who have contracts are taking the iron that is due them, but there is little or no new demand beyond an occasional carload. The machinists' and other strikes in this city have been as the last straw in breaking up what little tendency there was to buy iron, and now the disposition is to let matters drift. The cloud, however, is not without its silver lining to producers. They believe that the strike will divert attention from the pig iron situation long enough to arrest the downward tendency of prices. If Southern iron touches $9, a general start to buy is expected, which will result in some reaction. The tie-up on the lakes has diminished the supply of ore at furnaces in this locality, and it is understood that some will have to go out of blast unless a fresh supply is soon brought down. Again, there is the probability of a strike among the coal miners in Alabama and Tennessee which would affect the production of Southern irons. It is reported that the operators intend asking for a 5 percent reduction in the old scale as an offset to the increased demands which it is said will be made by the miners, and a deadlock is expected when the conferences are commenced. At the present time, prices are without change from those quoted in our last report. Southern No. 2 is selling on the basis of $9.25 Birmingham, and Northern No. 2 at $13.50, with only are relatively scarce and prices are firm.

Lake Superior Charcoal	$14 50 to 15 00
Northern Coke Foundry No. 1	14 00 to 14 25
Northern Coke Foundry No. 2	13 50 to 13 75
Northern Coke Foundry No. 3	13 25 to 13 50
Northern Scotch Foundry No. 1	14 25 to 14 50
Ohio Strong Softeners No. 1	15 30 to 15 80
Ohio Strong Softeners No. 2	14 80 to 15 30
Southern Coke Foundry No. 1	13 40 to 13 65
Southern Coke Foundry No. 2	12 90 to 13 15
Southern Coke Foundry No. 3	12 40 to 12 65
Southern Coke Foundry No. 4	12 15 to 12 40
Southern No. 1 Soft	13 40 to 13 65
Southern No. 2 Soft	12 90 to 13 15
Southern Gray Forge	12 15 to 12 40
Southern Mottled	12 15 to 12 40
Southern Silveries (4% to 6% Silicon)	14 85 to 15 85
Jackson Co. Silveries (8% to 10% Silicon)	17 80 to 18 30
Alabama and Georgia Car Wheel	18 85 to 19 35
Malleable Bessemer	14 00 to 14 50
Alabama Basic	13 15 to 13 40
Virginia Basic	14 40 to 14 65

Iron and Steel Bars.—Producers of both materials report that the demand greatly increased in the past week. In steel, the improvement was largely in the matter of specifications, which are said to have been heavier than for several weeks past. In iron bars, the greater portion of the 8,000 tons reported pending last week was placed. The bulk of it came from railroads or manufacturers of railroad equipment, one order for between 4,500 and 5,000 tons being placed by the Western Steel Car & Foundry Co., of this city, which had recently received large orders for cars from the Northern Pacific and the Seaboard Air Line. This order was placed on the basis of 1.35c Chicago, this figure now being the market price on large and satisfactory tonnages. Smaller lots, however, are firm at 1.40c, and there is no disposition to shade this price. We quote current prices in this market, carload lots, mill shipments, as follows: Bar iron, 1.35c to 1.40c, full extras; soft steel bars, 1.51½c, half extras, with 5c to 10c per 100 pounds extra for less than a carload and with regular extras for less than a ton of a size; angles, less than 3 x 3, 1.56½c base, half extras; hoops, 1.50½c, full extras. On lots from store, we quote iron bars, 1.75c base, full extras; steel, 1.70c to 1.80c base, half extras; hoops, 2c to 2.10c, full extras.

Billets.—The market is quiet and no sales of consequence are reported. Many offers are made, some at lower prices than the official schedule, but they find few if any takers. We continue to quote Bessemer and open hearth billets, 4 x 4 and larger, up to .25 carbon, $24; up to and including .60 carbon, $1 extra; over .60 carbon, $2 extra. Axle and forging billets, smaller than 4 x 4, $25 Chicago. Open hearth billets from store, $1.30 per 100 lbs.

Sheets.—While orders are continually being booked by mills, they are usually for small tonnages, and invariably the inquiry is sent to nearly all the producers in the market. This results in a variety of prices and much dickering on the part of the buyer in his effort to find the bottom of the market. Some producers are enforcing the new schedule, though others have no regular prices but are taking business at the best price they can get. We continue to quote for one pass, cold rolled, blue annealed sheets, mill shipments, Chicago delivery, as follows: Nos. 11-12, 1.86½c; Nos. 13-14, 1.91½c; Nos. 15-16, 2.01½c. On box annealed, one pass, cold rolled, Nos. 18-20, 2.11½c; Nos. 22-24, 2.16½c; Nos. 25-26, 2.21½c; No. 27, 2.26½c; No. 28, 2.36½c; No. 29, 2.51½c; No. 30, 2.61½c. Some changes have also been made in store prices, and leading local jobbers have adopted the following schedule: Nos. 8-10, 2.10c; No. 12, 2.20c; No. 14, 2.25c; No. 16, 2.30c; Nos. 18 and 20, 2.40c; Nos. 20-24, 2.45c; No. 26, 2.55c; No. 27, 2.65c; No. 28, 2.85c; No. 29, 2.95c; No. 30, 3.10c. Galvanized sheets have also been cut, and producers are quoting 80 and 2½ to 80 and 10 percent discount at mill, carload lots; while jobbers' prices on the same product range from 75 and 7½ to 75 and 10 percent discount.

Structural Steel.—The improvement in specifications continues and mills have booked a good sized tonnage during the week. Several new large buildings are being figured on in this city, and contracts are expected to be placed within a few weeks. Prices are firm and we quote Chicago delivery, mill shipments, as follows: Beams and channels, 16 inches and under, 1.76½c; 18 inches and over, 1.86½c; universal plates, 1.76½c; angles 3 x 3 and larger, 1.81½c; zees, 1.76½c. On lots from store, we quote beams, channels and angles, 3 x 3 and larger, 2c; 18, 20 and 24-inch, 10c extra; tees, 2.05c rates.

Plates.—Business has improved somewhat, and it is probable the plate mill at Chicago will be started up again this week. Store trade is good, though shipments have been delayed during the week as a result of a strike among the laborers employed in the various jobbing warehouses. We continue to quote association prices on carload lots, mill shipments, Chicago delivery: Tank steel, ¼-inch and heavier, 1.76½c; flange steel, 1.86½c; marine, 1.96½c; universal mill plate, 1.76½c to 1.81½c; 3-16-inch tank, 1.86½c; Nos. 7 and 8, 1.91½c; No. 9, 2.01½c; No. 10, 1.91½c; No. 11, 1.96½c; No. 12, 2.01½. From store, we quote tank steel, ¼-inch and heavier 2c; 3-16, 2.15c; No. 8, 2.20c; No. 10, 2.25c; flange steel, 2.25c to 2.35c, all f. o. b. warehouse.

Rails and Track Supplies.—New business is only of a nominal nature, though specifications for both heavy and light rails, as well as track supplies, continue heavy. Prices of light rails are weak as a result of the active competition for the business being offered. We quote heavy sections, mill shipments, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; light rails, $23 to $25, with regular differentials for immediate sizes. The following quotations on track supplies, which are f. o. b. Joliet mill, may be shaded on large orders. Angle bars, 1.40c to 1.50c; spikes, first quality, 1.70c to 1.80c (out of store, 1.90c rates); track bolts, 3½ x ¾, with square nuts, 2.30c to 2.40c per 100 pounds; with hexagon nuts, 2.45c to 2.55c, with differentials for other sizes.

Merchant Steel.—Some few contracts have been closed during the week for specialties for implement manufacturers. Specifications are good and mills are well supplied with business. Prices are firm, and we quote carload lots, mill shipment, Chicago delivery, as follows: Spring steel, 2c; sleigh shoe, flat sizes, 1.56½c; concave and convex, 1.76½c; cutter shoe, 2.25c; smooth finished machinery steel, 1.76½c base; smooth finished tire, 1.71½c; plow steel, 2.30c and upward, according to quality; toe calk, 2.06½c base. Ordinary grades of crucible tool steel, 6½ to 8c; special tool steel, 12c and up. Cold rolled shafting, 52 percent from list in carload lots, and 47 percent discount in less than carload lots.

Cast Iron Pipe.—Demand is of light proportions, being confined to the daily volume of small orders. Prices are without change, and we quote 4-inch water pipe, $26; 6 to 12 inches, $25; larger sizes, $24.50; gas pipe, $1 a ton higher, all f. o. b. Chicago.

Merchant Pipe.—The situation is unchanged from the conditions reported in our last review. City trade is quiet, though a comparatively good demand comes from the country districts. Prices of the leading producer are reduced one point but are being shaded on iron pipe by other manufacturers and we quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

MERCHANT PIPE.

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛ to ⅜ inch	67.35	57.35	64.35	54.35
½ inch	70.35	60.35	67.35	57.35
¾ to 6 inches	74.35	64.35	71.35	61.35
7 to 12 inches	69.35	59.35	66.35	56.35

Less than carloads, 12½ percent advance.

Less than carloads, 12½ percent advance.

Boiler Tubes.—There is a fair demand from store, though mill business is light. While the largest producer affirms that it is upholding the schedule given below, concessions from these prices are being made by other manufacturers. We quote the prices of the leading producer, carload lots, mill shipments, as follows:

BOILER TUBES.

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	43.35	40.35	52.35
1¾ to 2¼ inch	55.35	38.85	40.35
2½ inch	58.35	43.35	43.35
2¾ inch to 5 inch	64.85	50.85	} Up to 4 inches.
6 to 13 inch	55.85	88.35	} 50.85

Wire Products.—New business is light, though mills are actively employed in filling specifications for jobbers' stocks. The leading producer reports that it is upholding its schedule as set forth in the following prices to jobbers, which are for carload lots, Chicago delivery: Wire nails, carload lots, $2.10; less than carload lots, $2.15; cut nails, carload lots, 1.91½c base; less than carload lots, 1.96½c; smooth wire, carload, $2, and $2.05 for less than carload lots; galvanized

smooth wire, $2.30 in carloads, and $2.35 in lesser amounts; painted barb wire, $2.40 carloads, and $2.45 in less than car load lots; galvanized barbed wire, $2.70 carloads, and $2.75 less than carload lots. Staples, polished, carloads, $2.25; less than carload lots, $2.30; galvanized, $2.55 carloads and $2.60 less than carload lots. Bale ties, 82½ and 5 percent discount, f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or De Kalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Foundry Coke.—The market has taken on increased firmness during the week, and while still soft in places, it is much firmer than it was a week or ten days ago. Standard 72-hour Connellsville or Southern grades are held firm at a minimum of $2 at the ovens. The spot market is also easier since the great bulk of the tonnage on track paying demurrage charges has been moved, and prices of same compare more favorably with that asked for coke under contract.

Old Material.—The situation is practically unchanged. There is little demand, except that which is forced by the attractive prices of some dealers, and the market may be correctly characterized as a weak one. We quote prices paid on recent transactions as follows:

Old iron rails	$15 50 to 16 50
Old steel rails (mixed lengths)	9 25 to 9 75
Old steel rails (long lengths)	11 00 to 11 50
Relaying rails, subject to inspection	23 00 to 24 00
Relaying rails for sidetracks	18 00 to 20 00
Old wheels	12 00 to 12 50
Heavy melting steel	9 50 to 10 00
Mixed country steel	9 00 to 9 50

The following quotations are for net tons:

Low phosphorus scrap (.04 and under)	12 00 to 13 00
No. 1 R. R. wrought	11 00 to 11 50
No. 2 R. R. wrought	10 00 to 10 50
Shafting	12 50 to 13 00
Dealers' Forge, No. 1	9 00 to 9 50
Wrought pipe and flues	7 75 to 8 25
No. 1 cast	10 00 to 10 50
No. 1 mill	7 00 to 7 25
Country sheet	6 50 to 7 00
No. 1 boilers, cut	7 50 to 8 00
Boiler punchings	10 00 to 10 50
Iron car axles	16 00 to 16 50
Steel car axles	14 00 to 14 50
Iron axle turnings	7 50 to 8 00
Steel axle turnings	7 50 to 8 00
Cast borings	3 50 to 4 00
Mixed borings, etc.	3 50 to 4 00
Wrought turnings	6 50 to 7 00
Machine shop turnings	6 50 to 7 00
Railroad malleable	8 50 to 9 00
Agricultural malleable	8 00 to 8 50
Stove plate and light cast scrap	8 00 to 8 50
Old iron splice bars	12 00 to 12 50

CINCINNATI.

June 1.

The demand for coke has been light and the market dull and easy. Sales agents complain of many requests to suspend shipments. This is to some extent accounted for by consumers wishing to use up all coke on hand, as the outlook is favorable for placing contracts for the requirements of the second half of the year on a more favorable basis than they are now paying on their old contracts. Foundry coke is quoted at $2.00 to $2.15 f. o. b., Connellsville, for the best brands Some brands are offered at lower prices which are not so well and favorably known. A contract for furnace coke which covers requirements oabout eight cars per day for sixty days was placed here this week at $1.50 f. o. b. ovens.

Pig Iron.—Aside from the demand and inquiry that come from pipe makers but little is doing in the pig iron market. The largest sale of pipe iron was a block of close to 10,000 tons of No. 3 and No. 4 foundry which went at $8.75 and $8.50 respectively, Birmingham. Some No. 2 soft is reported sold to another pipe company at $9.15 Birmingham. Some sales to a consumer in Louisville amounting to about 1,700 tons of various grades brought out some low prices. No. 2 foundry sold in this lot at $9 and gray forge at $8 Birmingham. The Ohio stove manufacturer that was inquiring last week for 2,500 tons has not as yet placed his order. The above transactions and pending business cover all that can be learned in a specific way regarding the market. In Ohio irons there is little doing among the Cincinnati representatives of these furnaces and $12 at furnace for No. 2 foundry is the general basis for quotations, although traveling men report hearing of lower prices than $12 having been made in the territory. In Southern iron it is fairly well established that $9 Birmingham for No. 2 has been touched, but the general open quotation is still at $9.25 Birmingham for No. 2 as a basis. There is hardly enough trading or inquiry to bring out the lowest prices obtainable, and it is now a purely waiting situation all round. The following are current prices f. o. b. Cincinnati:

Southern Foundry No. 1	$12 25 to 12 50
Southern Foundry No. 2	11 75 to 12 00
Southern Foundry No. 3	11 25 to 11 50
Southern Foundry No. 4	11 00 to 11 25
Southern Foundry No. 1 soft	12 25 to 12 50
Southern Foundry No. 2 soft	11 75 to 12 00
Gray Forge	10 75 to 11 00
Northern Foundry No. 1	13 65 to 13 90
Northern Foundry No. 2	13 15 to 13 40
Southern car wheel iron	16 25 to 16 50

Finished Material.—The market is dull and easy and prices are revised to a lower level on sheets and bars. Demand is light and there is nothing of particular interest to note in the situation. Bar iron is quoted at 1.40c f. o. b. Steel bars, 1.48c base, half extras, with dealers quoting 1.75c to 1.90c for iron and steel out of store. Galvanized sheets are being quoted at 75 and 10 to 75, 5 and 2½ percent off. We quote black sheets, No. 27, at 2.35c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.70c; No. 27, 2.60c; No. 16, 2.35c; No. 14, 2.25c; No. 12, 2.10c; No. 10, 2.05c. Tank plates are dull and sell out of store at 2c for ¼-inch and 2.10c for 3-16-inch. Beams and channels are quoted at 2c from stock and angles at 1.90c to 2c for base sizes.

In merchant pipe new prices take effect tomorrow which are a return to the schedule in force on Feb. 1. There has been no change to note in the way orders are coming in, and the demand is quiet. Carload lots are quoted as follows f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜ inch	67.7	57.7	64.7	54.7
½ inch	70.7	60.7	67.7	57.7
¾ to 6 inch, inclusive	74.7	64.7	71.7	61.7
7 to 12 inch, inclusive	69.7	59.7	66.7	56.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	37.7
1¾ to 2¼ inch	54.2	36.7
2½ inch	56.7	41.7
2¾ to 5 inch	63.2	49.2
6 to 13 inch	54.2	36.7

Old Material.—Market dull and easy. Demand exceedingly light and prices are marked down compared with a week ago. We quote:

Old No. 1 railroad wrought, net tons	$10 00 to 10 50
Cast machine and foundry, net tons	9 50 to 10 00
Old iron rails, gross tons	12 50 to 13 00
Old steel rails, gross tons	10 00 to 10 50
Old short lengths, gross tons	10 50 to 11 00
Old iron axles, net tons	14 50 to 15 00
Stove plate, net tons	7 50 to 8 00
Wrought turnings, net tons	7 00 to 7 50
Cast borings, net tons	4 00 to 5 00

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, NO. 150 NASSAU ST., May 31.

Pig Iron.—The past week has been without a single feature, the buying continuing very light. The dullness in trade which founders are experiencing is exemplified in the frequency with which orders for car loads are being given out. Rarely does it happen that an order for 100 tons is given. While prices show no change from our previous report, they are not holding firmly, and lower prices are anticipated. While one of the leading Southern interests is quoting $9.50 Birmingham for No. 2 foundry, its competitors are taking orders at $9.25, and are only booking a small tonnage. The Southern situation is such that a desirable order could be placed at a slightly lower figure. There is very little doing in Northern irons, and in their anxiety to get orders some furnaces are shading prices. With many furnaces sales do not equal production, and announcements that some will either curtail their output, or blow out, are expected. There are very few inquiries in the market, and such as are out invariably call for early delivery. On the Metal Exchange pig iron warrants for No. 2 Southern foundry at $9.25 find no buyers. New York prices at tidewater follow: Northern No. 1 X, $15.25 to $15.50; No. 2 X, $14.75 to $15; No. 2 plain, $14.25 to $14.50, Southern No. 1 foundry, $13.50

to $13.75; No. 2 foundry, $13 to $13.25; No. 3 foundry, $12.50 to $12.75; No. 4 foundry, $12 to $12.25.

Finished Iron and Steel.—It has been an exceptionally quiet week. Orders for structural shapes have been few in number, and make up only a small tonnage. Structural material men pronounce May the dullest month of the present year, and do not take a very hopeful view of the immediate future, as they are doing very little estimating. Orders for plates call for small quantities, and are received irregularly. For bars a little better demand is reported in some centers, but as a general rule the mills are in need of orders. Sheets are a trifle more active, small lots for prompt shipment being more plentiful. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.35c; sheared steel plates, tank, 1.74½c to 1.80c; flange, 1.84½c to 1.90c; firebox, ordinary, 1.94½c to 2c; refined iron and soft steel bars, 1.49½c; sheets, in car load lots, New York, No. 28 black, 2.04c to 2.50c; galvanized, 3.45c to 3.55c.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, June 1.

The local iron and steel market continues quiet, and little new business is being placed. Concessions on sheets and iron bars have been reported, while quotations on black and galvanized merchant steel pipe have been reduced one point. The largest inquiry for pig iron in the market at present is for 12,000 tons to go to a cast iron pipe interest in this state. About 2,000 tons of this order have already been placed, and the remainder will be closed in the near future.

Iron Ore.—The market is at a standstill. Few furnaces need any ore and the fact that prices of Bessemer ores are now below what was considered minimum a few weeks ago encourages a further wait. Mesabi Bessemer has been sold at $2.85.

The lake tie-up continues and the positions of the contending forces seem more irreconcilable. A few boats have been sent out in the past week and the vessel owners expect to add to this number. President Keefe, of the longshoremen's union, is quoted to the effect that his union will stand by its contract with the Lake Carriers' Association, which is construed to mean that boats will be unloaded without regard to the union affiliation or non-affiliation of the captain. The Lake Carriers' Association has announced that in view of the threats of blacklist and other penalties made by the Masters' and Pilots' Association to deter members of the union from taking out their boats, the vessel men will never again employ any captain who is a member of the union. The captains are thus notified that they must give up all connection with the masters' organization if they expect to be employed on the boats of the lake carriers. The Cleveland branch of the National Civic Federation has held sessions with representatives of both sides this week, but neither captains nor vessel owners will agree to arbitration.

Pig Iron.—Valley furnaces are now holding No. 2 foundry at $12.00 to $12.50 at the furnace, while local furnaces are quoting $12.75 at the furnace for outside shipments. The Bessemer and basic iron markets remain merely nominal, the former being held at $12.15 to $12.25 and the latter $12, furnace. Lower prices are being named on Southern iron, No. 2 ranging from $13 to $13.10. Lower prices are also prevailing on coke. We quote pig iron, Cleveland delivery, as follows:

Bessemer	$13 00 to 13 10
No. 1 Strong Foundry	13 25 to 13 50
No. 2 Strong Foundry	12 85 to 13 00
No. 3 Foundry	12 50 to 12 75
No. 2 Southern	13 00 to 13 10
Gray Forge, Valley furnace	11 75 to 12 00
Gray Forge, Southern (Cleveland)	12 25 to 12 35
Lake Superior charcoal	14 25 to 14 50

Finished Material.—Lower prices are ruling on sheets, as low as 2.10c f. o. b. mill, 28 gauge, having been done in an extreme case on a desirable order. Bar iron for local delivery is still held on the basis of 1.35c Pittsburg, although this price can be shaded $1 a ton. Steel bars are quoted on the basis of 1.30c Pittsburg. The demand for structural material has improved somewhat during the past week. Specifications on the steel work for the Guardian Trust Co. will shortly be available. This building requires about 1,200 tons of material. Quotations on black and galvanized merchant steel pipe, except from 7 to 12 inches in diameter, have been reduced one point. Black sheets are quoted as follows: Mill sales for black sheets, No. 10, 1.70c; Nos. 11-12, 1.75c; No. 14, 1.80c; No. 16, 1.90c; No. 27, 2.20c; No. 28, 2.30c. Galvanized sheets 80 and 3 off list. Out of stock the prices rule about as follows: No. 10, 2c; No. 12, 2.05c; No. 14, 2.10c; No. 16, 2.20c; Nos. 18-29, 2.30c; No. 24, 2.35c; Nos. 25-26, 2.40c; No. 27, 2.45c; No. 28, 2.55c; No. 30, 3c. Galvanized sheets out of stock are quoted 75, 10 and 5 off for Nos. 16 to 20 and 75, 10 and 7½ off list for No. 22 and lighter.

Old Material.—Dealers are taking advantage of prevailing low prices and are laying in stocks of old material. We revise quotations as follows:

Old iron rails	$16 00 to 17 00
Old steel rails (over 6 feet)	12 00 to 13 00
Old steel rails (over 6 feet)	11 00 to 12 00
Old car wheels	11 50 to 12 00
Steel boiler plate	10 00 to 11 00
Malleable iron (railroad)	10 00 to 11 00
Malleable iron (agricultural)	9 00 to 10 00
Heavy steel	10 00 to 11 00

We quote the following net tons:

No. 1 R. R. wrought	$11 00 to 12 00
No. 1 busheling	9 50 to 10 00
No. 1 machine cast	10 00 to 11 00
Iron axles	16 50 to 17 50
Axle turnings	8 00 to 9 00
Wrought turnings (free from cast)	7 00 to 7 50
Grate bars	7 00 to 8 00
Pipes and flues	9 00 to 10 00
Tank iron	7 50 to 8 50
Hoop and band iron	5 00 to 5 50
Sheet iron	4 00 to 5 00
Wrought drillings	7 00 to 7 50
Stove plate	7 50 to 8 50
Steel axles	13 00 to 14 00
Cast borings	4 00 to 4 50

BIRMINGHAM, ALA.

BIRMINGHAM, Ala., May 31.—Southern pig iron market conditions show no improvement and in several quarters it is admitted to be very quiet and dull. What orders are received are in small lots and for immediate delivery. The production for the month of May will show as great a total as in the previous month, if not greater. The Republic Iron & Steel Co. has its No. 3 furnace still out for repairs. The Sloss-Sheffield Steel & Iron Co. announces larger production this month with six furnaces than ever before with seven furnaces. There is very little accumulation of iron as yet, though there may be some in June, if the demand does not improve. Inquiries fail to locate any intentions of cutting down the present production in this State. The old furnaces in operation in this State are breaking records, some which have capacities a little over 200 tons manufacturing 230, 250 and 261 tons of iron daily.

It is probable that during the month of July there may be an enforced reduction in production. The convention of the United Mine Workers of America in Alabama will be held in Birmingham commencing June 13. A week after that date the joint conference between the miners and operators will take place at which the new contract for the mining of coal will be arranged. There are prospects of a disagreement. The present contract expires July 1. It is not satisfactory to the operators and a change will be sought.

There is very little being done in finished iron and steel in the Southern territory. The Tennessee Coal, Iron & Railroad Co. has made preparations for a complete shutdown at the Bessemer mills, near Birmingham. The Amalgamated Association members have been on strike in this establishment for some three weeks and effective June 1 the day laborers will be dismissed from the service of the company. The Gate City mills (Republic Iron & Steel Co.), have been in steady operation right along. No. 2 foundry iron is selling at $9.25. Following prices are given: No. 1 foundry, $9.75; No. 2 foundry, $9.25; No. 3

foundry, $8.75 to $9.25; No. 4 foundry, $8.50 to $9; Gray forge, $8.25 to $8.50; No. 1 soft, $9.75 to $10; No. 2 soft, $9. to $9.50.

Cast iron pipe manufacturers in the Southern district are still enjoying good trade with indications of steady operations and shipments through the balance of the year.

The experts named by the Tennessee Coal, Iron & Railroad Co., Sloss-Sheffield Steel & Iron Co. and Republic Iron & Steel Co. to investigate the values of coal and ore properties, looking to a consolidation of the concerns, have made up their report and it will be in the hands of the companies interested in the next day or two. The report is almost entirely statistical but is of value to the companies interested. Men in a position to know say that the original idea has about been abandoned, though it is not impossible for it to be taken up again.

The Tennessee Coal, Iron & Railroad Co. has taken options on a large tract of land supposed to be rich in limestone or dolomite and tests are to be made at once.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., May 31.

Pig Tin.—The market for the past week has been chiefly notable for the reactionary tendency of prices, the weakness being especially marked in futures. Business continues to be very unsatisfactory, and manipulators on the bear side find much to encourage them. The London market for the week under review has been exceptionally weak, and prices for both spot and futures are off over £2 since last week. Closing prices at the Metal Exchange today follow: Spot, 27.00 to 27.37½c; June, 26.75 to 27¼c. London's closings today follow: Spot, £122; futures, £121 12s 6d. Arrivals for the month aggregate 3,615 tons, against 2,429 tons afloat.

Copper.—The situation in trade circles shows no change, new business being very light. Exports for the month amount to 12,700 tons, as compared with 9,062 tons for May last year. It is not thought that exports will cut such a large figure in the month to come. In London the market has been fairly active, with prices slightly lower. Today's closings at the Metal Exchange follow: Lake, 13.00c to 13⅛c; electrolytic, 12¾c to 13c; casting, 12½c to 12¾c. London closed today, £56 7s 6d for both spot and futures.

Lead.—The leading interest again reduced its prices during the week for 30-day shipments from 4.35c to 4.25c, but spot is scarce and strong at 4.35c to 4.40c. St. Louis and London are both lower, being quoted at 4.20c, and £11 8s 9d, respectively.

Spelter.—Has declined considerably, spot offering at 4.87½c to 5.00c, and June at 4.75c to 4.87½c. St. Louis is much lower at 4.65c, with London stronger at £22 5s.

Antimony.—Cookson's is offering at 7½c, Hallett's at 7.00c to 7¼c, and other brands at 6⅛c to 6⅜c.

Quicksilver.—We quote $45 per flask of 76½ pounds in lots of 100 flasks. London is £8 5s.

Nickel.—Sales are made at 40c to 47c for large lots down to a ton, and at 50c to 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, May 31.

There is no sign of any improvement to the quiet conditions that have prevailed in the local metal market for several weeks. If anything, demand is less than it was, and recessions are noted in several products, including copper, spelter and pig lead. Lake is quoted 13⅜c for carloads, and 13⅝c for less than carload lots; casting 12⅞c for carloads and 13⅛c for smaller quantities. Pig tin is unchanged at 29¼c to 29½c, according to quantity. Spelter, 5c to 5.05c in car lots, and 5.10c to 5.15c in lesser lots. Sheet zinc, 6.20c, car lots of 600 lb. casks, and 6.45c to 6.50c in less than car lots. Pig lead, 4.30c in carloads, and 4.35c to 4.60c in lesser amounts.

Demand for old metals is at a minimum; prices are weak and of a further downward tendency. We quote as follows: Copper wire and heavy, 11c; copper bottoms, 9¾c; copper clips, 11c; red brass, 9⅝c; yellow brass, (heavy) 7½c; yellow brass borings, 6c; red brass borings, 7⅝c; light brass, 5⅜c; pipe lead, 3.60c; tea lead, 3¼c.

THE THOMAS IRON CO.'S CELEBRATION.

(Special Telegram.)

HOKENDAUQUA, Pa., June 1.—This was a red letter day in the history of Hokendauqua, on account of the celebration of the Thomas Iron Company's 50th anniversary here. About 25 stockholders and 100 guests accepted invitations to be present, and all were served with an elaborate dinner. The Thomas Iron Co.'s plant has been in continuous operation since its incorporation in 1854, and it product is known all over the United States. It is the only iron company perhaps in this country that has continued in operation for so long a time without reorganization or having been absorbed by some other company or having its original corporate name changed. A copy of the souvenir history of the company, compiled by the officers [from which extracts are printed elsewhere in this issue] was given to each stockholder. Dinner was served in a large pavilion erected on the company's property. Rev. Dr. James A. Little, pastor of the Presbyterian church at Hokendauqua for 36 years, offered prayer and Hon. Charles F. Chidsey, of Easton, acted as toastmaster. Speeches were made by Capt. F. R. Drake, of Easton, on behalf of the management; Robert E. Wright, of Allentown; Edgar S. Cook, of the Warwick Iron & Steel Co., Pottstown; G. W. Cope, associate editor of the *Iron Age*; John Birkinbine, of Philadelphia; John Fritz, of Bethlehem, and W. G. Bessler, first vice president of the Central Railroad of New Jersey. During the afternoon the stockholders and guests were taken on a trip over the Ironton railroad, owned and operated by the company.

At the South Sharon, Pa., plant of the Carnegie Steel Co. four of the open-hearth furnaces are now operating by the Monell process. These furnaces have been shut down for several weeks to prepare them for producing steel by this method. All of the open-hearth steel at the Homestead plant is produced by this process and it is gradually to be extended to all of the basic steel plants of the Steel Corporation.

The first train over the new Wabash bridge, spanning the Monongahela river, was run June 1. The Wabash road is now completed as far as Mingo Junction, O., and trains will be running about the middle of this month.

A meeting of iron pump manufacturers of the United States was held at Chicago this week, and an organization under the name of the National Pump Manufacturers' Association whose purpose it is to collect and disseminate information of interest to its members, was formed. The following officers were elected: F. E. Myers, president; H. I. Park, vice president; E. H. Sleight, treasurer; T. R. Barnes, secretary; W. M. Webster, commissioner. The association has a membership of 76 manufacturers.

Blast furnace E of the Colorado Fuel & Iron Co., was blown in this week, after an extended idleness. The furnace has been relined and practically rebuilt. Furnaces A and D, which are also idle and which were recently relined, will be blown in shortly. Furnace B will continue idle, however, and will be practically rebuilt during the summer months. A steady supply of coke has been assured to the furnaces. The Bessmer steel department will be in operation the latter part of this week.

The Niles-Bement-Pond Co., of Liberty street, New York, has issued the "Progress Reporter," an illustrated chronicle, which will be published every few weeks. The object of the publication is to keep the employes of the company, and the public generally, informed as to the new machines and devices which are constantly being brought out. Any customers, or their employes, or the friends of the company generally, who may desire to receive copies regularly can do so by writing to that effect to the New York office. Among several excellent halftones is a full-sized reproduction of a steel worm 3⅝ inches in diameter by 4½ inches long, the thread of which was cut on a Pratt & Whitney thread milling machine in 16 minutes.

Philadelphia Machinery Market.

PHILADELPHIA, May 30.—The machinery market is dull, and the outlook unpromising. The volume of trade during the past thirty days was fully as light as that for the two preceding months. Of late there has been almost an entire dearth of orders of any magnitude. Standard lines of tools and equipment appear to have been in smaller demand than machinery of special design. Indeed most builders of specialties are able to keep their plants running at something like their full capacities.

A round of the various machinery building establishments discloses the extent of the decline from which the trade is now suffering. It is no exaggeration to say that the combined working forces of plants today would not exceed one-half of the forces actively employed eighteen months ago. Few establishments are running on back orders, most of them being engaged in producing stock. One of the largest companies building machine tools and special machinery is running but five days a week; and another is reported as having accumulated over a quarter million dollars' worth of stock and contemplates a complete shutdown of most of its departments. In the Baldwin Locomotive Works hundreds of hands have been laid off within the past ninety days, the force having been depleted nearly twenty-five percent in six months. Orders for locomotives are not nearly so prolific as last year at this time, and the output is in consequence considerably decreased.

The Pencoyd plant of the American Bridge Co. is again in operation, mostly on construction work for the rebuilding of the burned district in Baltimore. It is understood that the plant has not in hand a single bridge order, and its machine shop is practically idle.

At the Bourse there is very little activity. Few of the many agents making the machinery department their headquarters are to be found during the active hours of the day, finding it now quite necessary to hunt for orders outside. Stocks of machinery at the Bourse show big gaps, which there is evidently no intention to fill. In foundry circles there have been a few shutdowns, one prominent in the manufacture of a standard line of machinery closing up temporarily for the lack of new business, the number of orders coming in being less than received at any period within ten years. Dealers in foundry supplies and equipment report business as very slow, with no prospect of immediate improvement.

In the face of existing conditions inquiries are numerous, and estimating departments are kept pretty busy. From the character of these inquiries there is little doubt that they are going the rounds in other markets. There are a few Government specifications in the market, but unimportant in scope. It was expected that specifications in connection with the equipment required in the construction of the Pennsylvania railroad's New York improvements would have made their appearance before this, but so far they are not in evidence.

The Newton Machine Tool Works report business fair during May. Shipments were light and covered small to medium standard tools. Inquiries coming in are satisfactory in both number and quality.

The Turner Machine Co., builder of brass workers' grinding machinery, continues fairly busy. It has just shipped grinding machines to England and Australia, and made deliveries of machines to prominent concerns in this country.

The I. H. Johnson Jr. Co., builder of lathes, reports that business showed a slight improvement during May, in both orders and inquiries. A number of shipments of lathes were made, none however of a size particularly mentionable. This company is meeting with much success in the introduction of its new electrically driven lathes, duplicate orders having already been booked.

The Baldwin Locomotive Works, while not so actively employed as a few months ago, continues to book some nice orders for locomotives. It has just completed an order for thirty new high-speed passenger engines for the Stata Fe railroad, for use on the special trains to run from the Pacific Coast to the St. Louis Exposition. The engines are of the De Glaud balance compound type, with four cylinders instead of two as usual, which will give increased speed.

The Edwin Harrington & Son Co. has vacated the buildings it occupied for a number of years, and is now installed in its splendid new building at 17th and Callowhill streets. It will be several weeks before the shops will be completely running, but all orders can be taken care of with the present equipment. Estimates for the erection of a one-story brick blacksmith shop 100 x 21 feet on a site adjoining the new plant are being received. Business is reported very fair, both in the hoist and machine tool departments.

The Espen-Lucas Machine Tool Works reports business as satisfactory, and some good orders for cold saws are being booked. This company expects to place on the market shortly one or two new tools possessing some novel features.

The Falkenau-Sinclair Machine Co. reports that its business so far this year compares very favorably with the business for the same period last year. Orders received during the month, and shipments made, covered almost exclusively small and standard punching presses, straight sided and double headed stamping presses.

Personal.

A tour of inspection of the Carnegie Steel Co.'s plants in the Youngstown and Sharon districts was made last week. In the party were James Gayley, D. G. Kerr, H. A. Finnerty, D. M. Clemson and A. C. Dinkey.

W. H. Creahan has been appointed superintendent of the plant of Spang, Chalfant & Co., Pittsburg.

Chas. R. Hewitt, well known in the pneumatic tool field, has just accepted a position as salesman with the Rand Drill Co. He will be connected directly with the selling of the Imperial tools.

T. F. Manville, president of H. W. Johns-Manville Co., New York; E. B. Hatch, president of Johns-Pratt Co., Hartford, and J. W. Perry, manager of the electrical department of the former company, sailed for England on April 26 and will return about June 10.

John H. Pierce has resigned as president of the Western Tube Co., of Kewanee, Ill. Ill health is assigned as the reason. Mr. Pierce has been identified with the company for 30 years and during the past 15 years has been its president.

Harold Jeans, managing editor of the London *Iron and Coal Trades Review*, is in the United States. He has visited Pittsburg and Cleveland this week.

The annual meeting of the Lorain Steel Co. was held at Johnstown, Pa., this week and officers were elected as follows: Daniel Coolidge, president; P. Lavelle, Johnstown, vice president; P. M. Boyd, Philadelphia, secretary and treasurer.

P. H. Biggs, who for the past two years has been traveling agent for the C. C. Worner Machinery Co., Detroit, Mich., accepted a similar position with Strong, Carlisle & Hammond, of Cleveland, on June 1.

Edward B. Ellicott, city electrician of Chicago, who procured a leave of absence to become chief electrician and mechanical engineer of the World's Fair at St. Louis, has resigned his position with the exposition. Charles F. Foster, operating engineer of the exposition, will be his successor.

C. C. Tyler has resigned his position as superintendent of the works of the Westinghouse Electric & Manufacturing Co. at East Pittsbuurg, Pa., which he has held for the past six years, and has been appointed general superintendent of all the works of the Allis-Chalmers-Bullock interests in the United States. Mr. Tyler, who will enter upon his new duties on June 15, will make his headquarters at Milwaukee.

Robert I. Clegg, editor of the machinery department of *The Iron Trade Review*, sails for Liverpool on the Teutonic on June 8, for an absence of several weeks. He will visit a number of important engineering establishments in Great Britain.

AN AUTOMATIC KEYWAY MILLING MACHINE.

BY DR. ALFRED GRADENWITZ.

The machine illustrated herewith, Fig. 1, was brought out recently by the Sächsische Maschinenfabrik, formerly Rich. Hartmann, Chemnitz, Germany. While serving in the first place for making long keyways and grooves in shafts and other objects, this machine may be used advantageously for heavy boring and milling work. The grooves are cut in a perfectly automatic way.

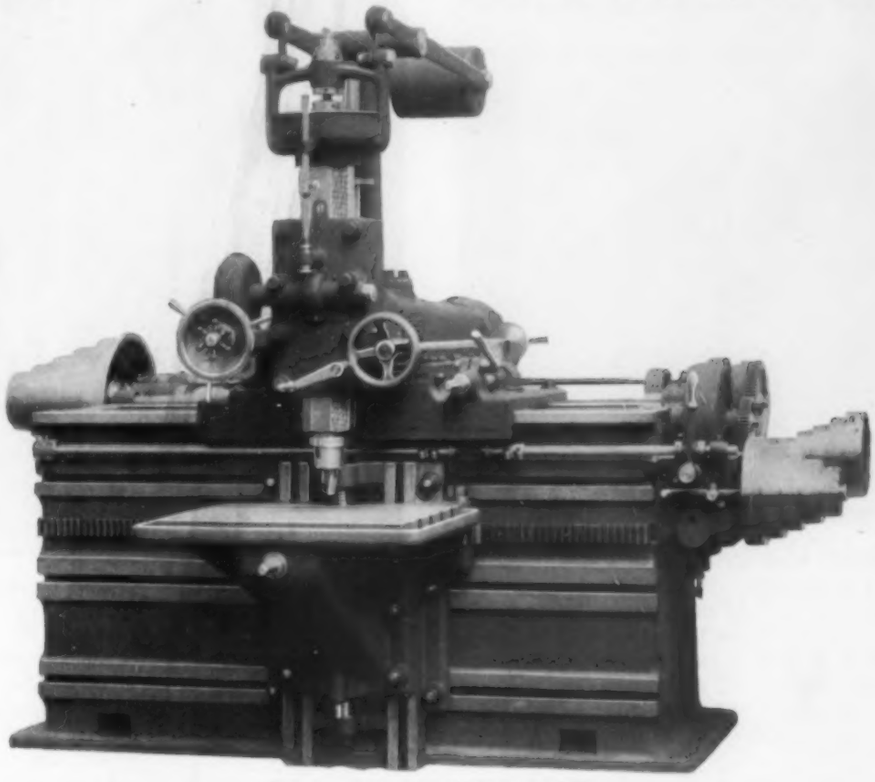


FIG. 1.—A GERMAN MILLING MACHINE.

On a solid bed there moves between rectangular strips a carriage supporting the boring head. In this boring carriage, and capable of being adjusted by hand in a crosswise direction with respect to the carriage on the bed, there is fitted a vertical shaft. The latter is driven by means of a five-step pulley from a driving axle mounted behind the bed. The reciprocating movement of the boring shaft is effected by means of a screw mounted in the bed and by a reversing gearing connected to the latter and operated by a step pulley from the driving shaft. In the interior of the five-step driving pulley there is fitted a friction clutch which is controlled from the workman's position. This affords possibility of instantaneously stopping the machine in all its movements. The machine allows of a chip depth as high as 5 mm. (.197 inch) to be obtained with grooves of medium and large widths up to 80 mm. (3.15 inches) across. The carriage on the bed is held at the ends of the groove for sufficient time to obtain the chip depth required, when the carriage moves on to the other end, where the same process is repeated. Fig. 2 represents a piece of work where, by means of the tool shown, there has been milled out a groove 80 mm. in breadth. On the left end of this groove the way in which the drill, while in this terminal position, has worked the chip depth of 5 mm., may be distinctly seen. The round piece of material left is worked away on the drill going on to the right, by means of the internal cutting edges of the tool.

FIG. 2,—MILLING CUTTER AND SAMPLE OF WORK.

On account of its solid design, and of the fact that the drill works with a chip depth as high as 5 mm., the machine has an excellent efficiency. Any movement may be controlled readily and safely from the workman's place. A further feature is the fact that the lateral surfaces and rounded parts at the ends of the grooves are worked out very accurately.

The pendant telephone made by the Vought-Berger Co., of La Crosse, Wis., is quite a departure from the ordinary 'phone. It is installed at the ceiling and a grooved fiber pulley (in the case of the magneto 'phone) is fastened to the generator in place of the ordinary crank. A small dog engages with a ratchet, and when the pulley is turned in this direction the armature is rotated. The turning of the pulley is accomplished by means of the long flexible cord attached to the hand telephone. The cord passes around the pulley and thence to a counterweight and another fiber pulley and then is fastened to the ceiling cabinet. In a magneto system the simple act of lowering the micro telephone signals central and then by placing the fingers on a lever on the receiver the calling party is ready to converse. A light pull on the telephone at the close of the conversation gives the disconnecting signal to the operator. In the case of a central energy system, pulling the hand telephone to the position wanted and pressing the lever gives the signal, releasing the lever is a disconnecting signal. The hanging phone has an adjustable length of 15 to 20 feet vertically and thus gives a wide range for use over a number of desks. The company also makes a two-ball adjuster for incandescent lamps. This consists of two ornamental balls concealing pulleys. The lower one acts as a counterbalance for the light.

The Buckeye Sand Co., with offices in the Ferguson building, Pittsburg, and the Schofield building, Cleveland, miner and shipper of Conneaut and Kinsville molding sand, has purchased the entire output of the sand banks of the Union Sand Co., of West Springfield, Pa., for a period of five years.

A Modern Factory for the Manufacture of Injectors.

A good injector is about as neat and skillful a piece of metal working as the mechanic is likely to see. The injector is in itself a device of general adoption, about which much has been written and yet the peculiarities of its performance and design are full of mystery even among the men who daily handle it with success. It is not, however, the purpose of this article to enter upon a discussion of the injector as much as to present some particulars of a plant especially arranged for the manufacture of this line of work. The Hayden & Derby Mfg. Co. and the Hancock Inspirator Co. are constituent companies of the United Injector Co., of 85 to 89 Liberty street, New York, with a sales office also on South Canal street, Chicago. C. A. Moore is the president, J. N. Derby vice president, and S. B. Aller secretary and treasurer of the three companies named.

FIG. 1.—A MODERN FACTORY FOR INJECTOR MANUFACTURE.

& Derby Mfg. Co. was formed in 1888 and 1889 the firm of Manning, Maxwell & Moore became identified with the company and for a number of years C. A. Moore has been the president. In 1900 those interested in the Hayden & Derby Mfg. Co. purchased the entire capital stock of the Hancock Inspirator Co. The Hayden & Derby Mfg. Co. has a record of making and selling over 150,000 Metropolitan injectors.

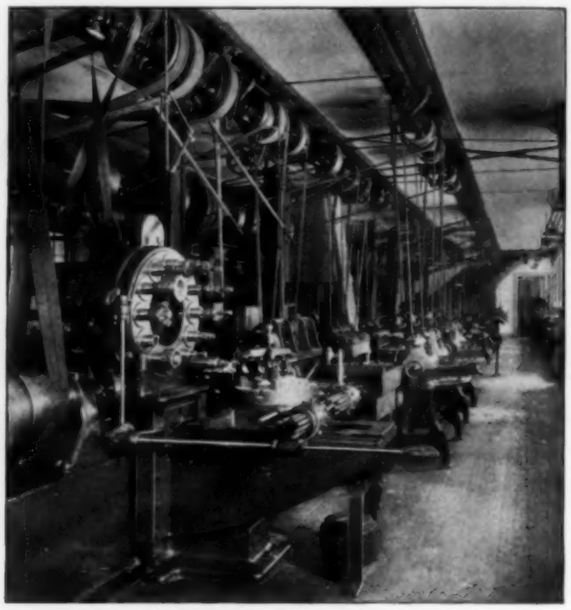


FIG. 3.—HEAVY MACHINE TOOL DEPARTMENT.

The two plants are located in the one factory on Watson street, Boston, Mass., and both are handled by Superintendent W. R. Park. From 260 to 300 workmen are employed. The structure was originally planned and fitted for the manufacture of Hancock inspirators but is now occupied by the Hancock Inspirator Co. for the manufacture of the special product of that firm and is also used by the Hayden & Derby Mfg. Co. for the production of Metropolitan injectors. The Hancock inspirators are in very general use throughout the

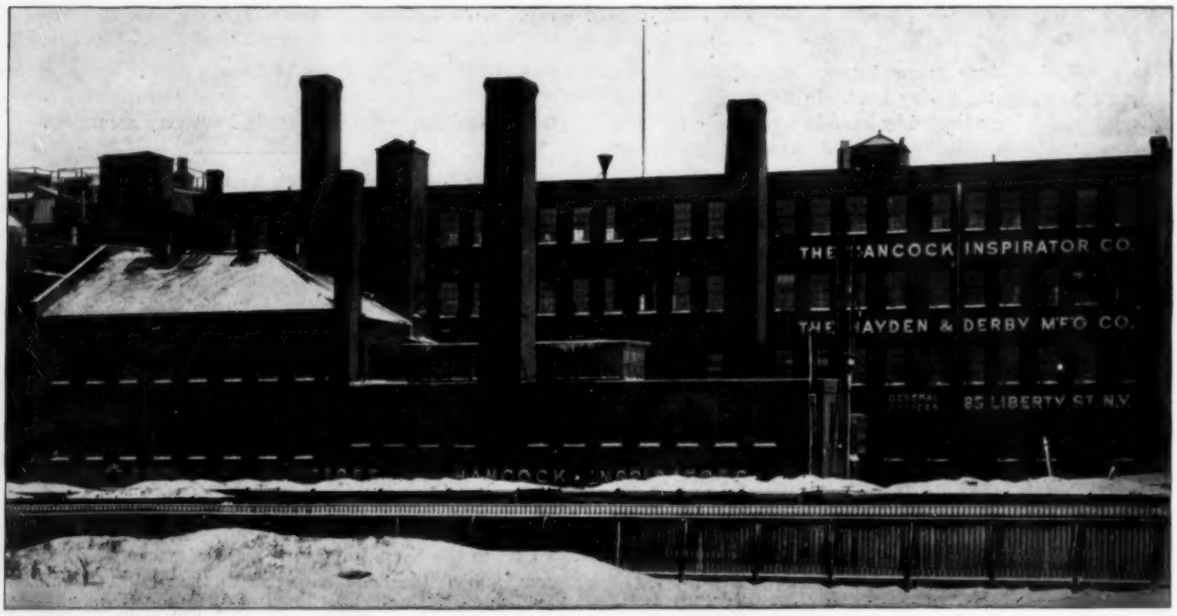


FIG. 2.—VIEW OF FACTORY FROM THE RAILROAD.

The Hancock Inspirator Co. was organized and commenced business in 1876 and has manufactured over 300,000 inspirators. The original product was that form of the Hancock inspirator which is known as the stationary type, but the company has also made and is still manufacturing the Hancock locomotive inspirator which has been adopted as a standard on many railroads and particularly for use with high pressures of the most modern locomotives. The Hayden

United States and Canada for feeding locomotive boilers. A number of appliances and attachments accompanying the boiler feeders for railroad work are also made by the company together with a line of globe and angle valves for high pressure steam service. The work, as can readily be understood, calls for a high grade of metal in combination with excellent workmanship. The drafting room of plants of this type is also responsible for the practical forms determined by long experience with the compromise between theory and accepted design and the production of an economical and reliable machine of a commercially successful construction is a task of considerable mechanical difficulty.

General Features of the Factory.

The main factory building is a substantial structure of brick and steel. It is in an ideal location in a residence neighborhood and is at the same time on the main line of the New York, New Haven & Hartford railroad. The main building is four stories high with basement and is 175 feet long by 38 feet wide. Fig. 1 is a view of the plant from Watson street and Fig. 2 as seen from the railroad tracks. The locations of the plant among residences has probably had much to do with the design of the building, and the pleasing style of architecture is none the less attractive because of the simple lines, the numerous windows and the arched entrance. Even the runways of the blue print apparatus on the second floor, directly in front of the spectator from the point of view selected in Fig. 1, are so unobtrusive in a general view as not to mar the harmony of the effect as a whole. The blue printing outfit is seldom an ornament to

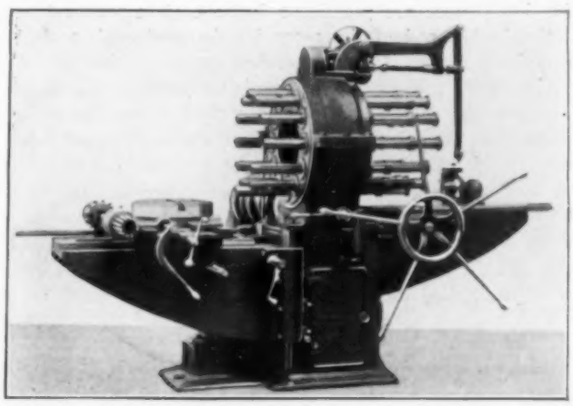


FIG. 4.—HEAVY AUTOMATIC BORING AND MILLING MACHINE FROM OPERATING SIDE.

the exterior of a building and at the best is only expected to barely escape being a positive blemish. The main building of the plant receives light on all four sides and being comparatively narrow the center of each room is remarkably well lighted. The matter of lighting will receive some little attention later in considering the manufacturing departments.

The halftone presented in Fig. 2 not only shows the rear of the factory but illustrates the separate building at the left which contains the boiler room and foundry. The power plant consists of a 90-h. p. boiler of locomotive type carrying 120 pounds steam pressure for heat and power and the plant is driven by a Corliss engine. The boiler room has also a Babcock & Wilcox 120-h. p. boiler of high pressure construction and this carries 350 pounds steam pressure for testing purposes.

Manufacturing Department.

The first floor on Watson street and at the left of the entrance is reserved for the executive and the main offices of the plant. The greater part of the main floor is devoted to the largest machines of the manufacturing and tool departments. Fig. 3 illustrates some of the tools for the heavier work but is most noticeable for the special boring mill employed for boring and milling the large inspirators. This machine was built by the Bullard Machine Tool Co., of Bridgeport, Conn. Fig. 4 is a view of the machine from the operating side. A large rotating ring carries a dozen spindles and these are capable of rotation on their axes as well as translating round with the main supporting circle. At the rear end of each spindle is a pair of collars which engage with a heavy socket and slide. This socket and slide by means of a capstan wheel may be drawn back and forth parallel

FIG. 5.—PATTERNMAKING DEPARTMENT.

with the spindles. Each spindle in turn engages the grip on reaching the lowest part of the circular travel and in that position the spindle can rotate and at the same time advance and recede upon the work held on the circular table. This is seen in front of the machine and has an inspirator in position. Several holes must be bored, reamed and tapped with scrupulous accuracy in the way of location, direction and dimensions. The work support can be rotated and the stops at right and left of the bed limit the sidewise movement of the table and of course the movement of the tools toward

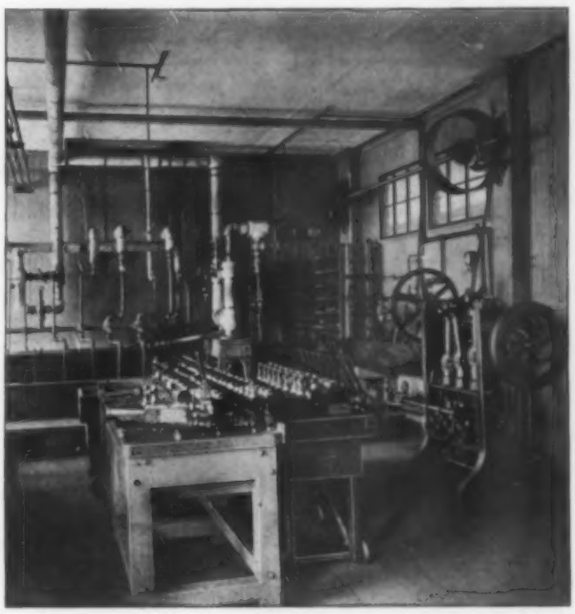


FIG. 6.—A PORTION OF THE TESTING DEPARTMENT.

the work or the action of the table toward meeting the cutters is as positively driven as the motion in the reverse directions. The machine has all the certainty of a jig and at the same time is automatic in action with a considerable range in the matter of adjustment. The size of the machine

FIG. 7.—A MANUFACTURING DEPARTMENT.

and the evident amount of supporting metal tell a plain story regarding character of work.

Patternmaking, Testing and Tool Rooms.

The second floor is occupied by the drafting rooms, foremen's offices, patternmaking department, assembling room, testing room and laboratory. The patternmaking department is shown in Fig. 5 and while giving some idea of the equipment required for wood pattern work in a plant of this kind also offers one or two other points of interest. The room is flooded with light and here if anywhere in the establishment clear vision is an all powerful assistant to the best work. The trim walls and ceiling, the supply of cupboards and exclusion from other departments with their unavoidable interference are prominent features. The wall cabinet at the further end of the room for the workman's tools is becoming a common and convenient receptacle for patternmaking tools. Many patternmaker's cabinets have a number of wooden leaves, book fashion, hinged in the same manner as the doors and both sides of these are fitted with racks, clips, etc., for the ready storage of tools. This way of placing tools keeps them apart from each other and is much superior to the crowded box or the rack running along the edges of the bench, the former being likely to damage keen edged tools and the latter convenience does not have the neat security of the locked cabinet.

A photograph of the testing room is seen in Fig. 6. This

FIG. 8.—TURRET MACHINERY FOR FINISHING SMALL PARTS.

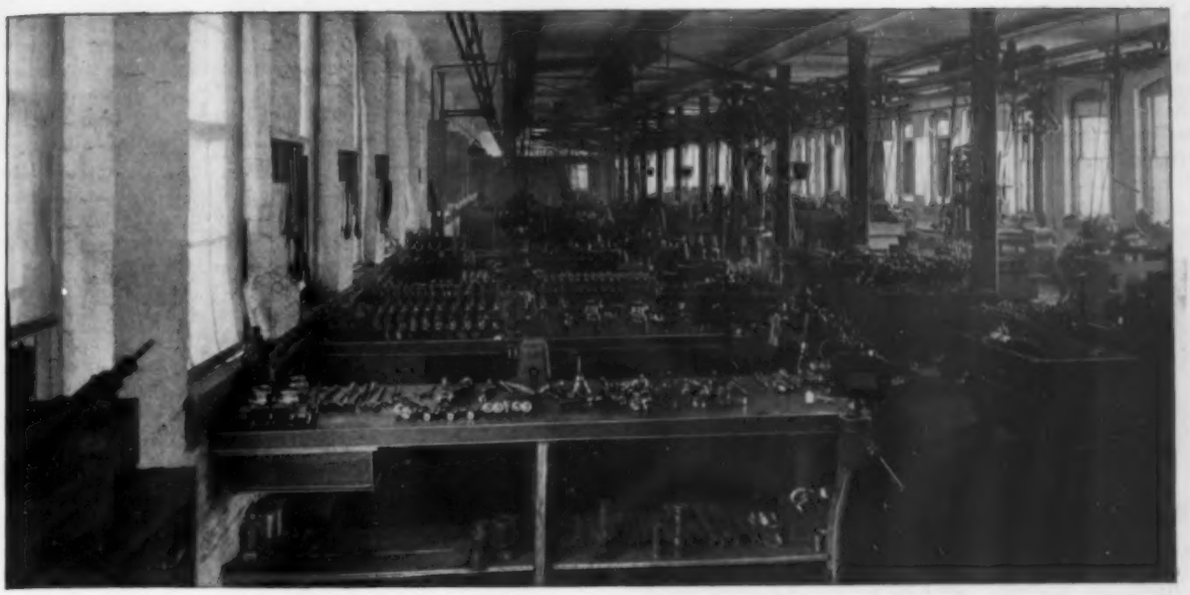


FIG. 9.—AN INJECTOR ASSEMBLING DEPARTMENT.

view exhibits only a part of the equipment but this is representative. A belt driven force pump (at the right of the halftone) supplies water pressure and there is direct connection also with the high pressure steam boiler in the power plant. The combination gives every facility for the examination and test of the apparatus under extreme and average working conditions. The injectors, valves, and other items of the product are brought to this department and handled from the trucks as shown. Suitable fittings for the different sizes are kept in readiness as may be seen by the fitting rack at the rear and right of the room. The batches of work come in lots and are individually adjusted and subjected to test with ease and speed.

Fig. 7 shows the general arrangement of the small tools on the third floor. This floor is filled with small turret and similar tools and here at one end is the jet department. The supply of cupboards for clothing, etc., the freedom of the floor from stock and the trim ceiling and walls are noticeable features. The product is handled on high trucks level with the benches and tools and this not only keeps the room clear but has manifest advantages in handling, etc.

In Figs. 8 and 9 are two views taken on the fourth floor. Fig. 8 illustrates a battery of turret machinery on each side of the room and the intervening space taken up with racks and trucks carrying stock parts in various stages of the manufacturing processes. Fig. 9 is one of the assembling departments with a large number of injectors being set up. The benches are of course especially equipped for the purpose and have vises for gripping the threaded shanks of the injectors and holding them in any desired position. The heavy wrenches and similar bench tools are supported on wall racks and the special fittings, gauges, bushings, etc., are kept on the shelves under the assembling benches.

The Foundry and Core Room.

The foundry is in the rear of the main building, as shown in Fig. 2, and is connected by wings and passageways to the rest of the plant. It is 186 feet long and averages about 30 feet wide. A portion of the foundry is presented in Fig. 10 and is not only well lighted from the surrounding windows but has the additional benefit of ample skylight illumination. The foundry is capable of producing 150,000 pounds of composition castings per month. Over a part of the foundry proper is a supplementary bench molding department, core room and pattern storage. The core room is 18 feet wide and is provided with Millet and reel ovens. The pattern storage is 25 by 57 feet and is entirely fireproof. In this connection it is proper to state that the drafting department is also supplied with a fireproof vault for the storage of tracings and drawings. Opening directly from the foundry is the snagging department, Fig. 11. This room has all the necessary benches, scales and racks for cleaning and storing stock previous to machining. Inclined presses are equipped

FIG. 10.—A PORTION OF THE FOUNDRY.

with shear blades for cutting the castings from the gates. This view, Fig. 11, also illustrates one of the requirements in the standard slow burning and fireproof structures. The ceiling is arched with brick resting on the lower flanges of the I-beams and care is shown also in other directions to avoid the occurrence of any supporting surface for inflammable material to rest.

Genesis of a Bin Kink.

Fig. 12 is a view taken in the shipping department in the

FIG. 11.—THE SNAGGING DEPARTMENT.

basement of the main building. Here the product is stored in bins provided with covers, boxed for shipment and sent out as ordered. The basement also contains the supplies used in the factory and is connected with the annex, on the same level, containing the boilers and engine. The front of each of the store bins is covered by an inclined lid, as may be seen in the series of storage bins facing the spectator and at the rear of the picture. Anent these bins there is somewhat

FIG. 12.—SHIPPING AND SUPPLY DEPARTMENT IN BASEMENT.

of a story which shows that the faculty of seeing the full value of any device is not any too common. The bin boxes are covered with doors and the draftsman who laid out the plans tells his experience somewhat as follows: "I wanted some arrangement to hold the doors open when the stock parts were put into or taken out of the boxes but could see no simple way of doing this to suit me. The doors came closely side by side and I could not hold one door by a latch of some kind on the next one in the row with any degree of satisfaction. Mind you, a simple plan that would cost nothing to speak of, and would not worry the men who were to handle the doors, was the needful thing. I was in a hurry and convinced myself that the best thing to do was to rush them together and then tackle the latch proposition when I had more leisure. I went down to the storeroom after they were put into service and thought I could now get an idea about the solution of the problem. A man came along for some finished work as I stood there. He lifted up the doors A and B, Fig. 13, dropped the latter on the uplifted end of the former as shown by the engraving and he could get at the contents of the bin O. K. A strip of wood running along the inner and lower edge of the lids would prevent the lower one sliding out and A would then be securely held in place by the cover B. But the scheme worked nicely as it was, had no complications and was another proof that the designer does not see all the good and bad points of his work as other people look at them."

It has been the constant policy of the management to add to the comfort of the workmen in every practicable way and the excellent sanitary arrangements of the works are the

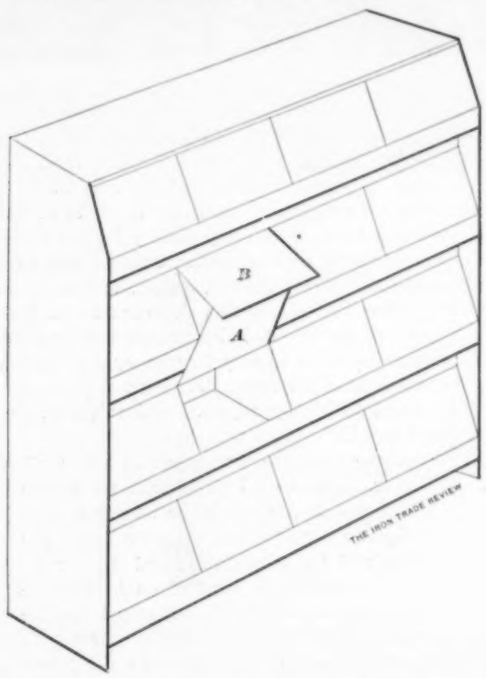


FIG. 13.—METHOD OF HOLDING THE BIN DOORS.

result of this policy. The walls and ceilings are whitewashed once or twice a year, the woodwork painted, the plumbing constantly overhauled and maintained in perfect condition.

The Philadelphia Rapid Transit Co. is being organized at Philadelphia, for the purpose of building a tunnel under the principal business section of that city for the transfer of freight from the docks and railroad freight houses to stores and warehouses in the business district. William Flinn is the principal promoter of this scheme. He hails from Pittsburg and also is asking for the privilege of building a similar tunnel in the business district of that city.

The Fisher Governor Co., Marshalltown, Ia., reports that while its trade is not as heavy as it was a year ago, it does not expect any material falling off in the volume of sales for the year. The company is increasing its power plant equipment by the installation of a new boiler and boiler house.

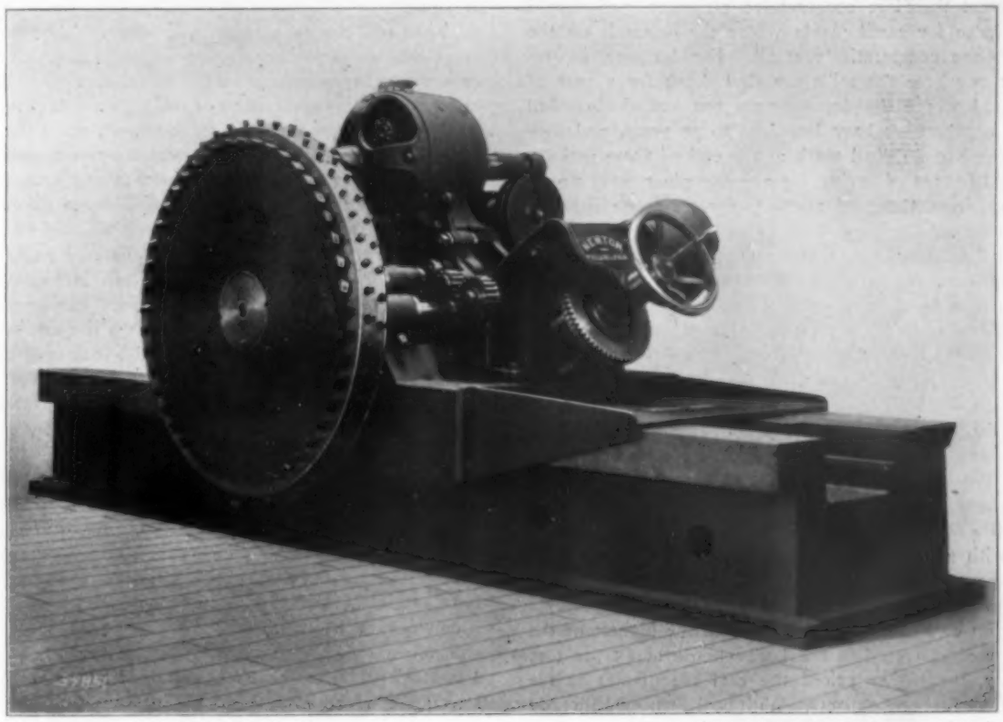
A small plant for working sheet metal is to be erected by Young Bros. & Co., Detroit. The building will be two stories high and 24 x 50 feet in size.

The Sullivan Machinery Co., Chicago, is moving to its new and more commodious offices corner of Jackson boulevard and Michigan avenue.

A 60-INCH ROTARY PLANING MACHINE.

The illustration shows a new 60-inch portable direct motor-driven rotary planing machine. The cutter head of this machine is 60 inches in diameter over the tools, and is driven by a 50-h. p. motor through a phosphor bronze worm wheel and hardened steel worm (of steep lead) by an internal gear ring and pinion. The cutter head is fitted with two broad tools for finishing, the tools set opposite to each other. The saddle movement is obtained by an entirely new method, being traversed by means of a spiral pinion and rack; the rack being set into the bed. This method is a considerable improvement over the old style of feeding the saddle by means of a screw.

The saddle has four changes of positive gear feed and power quick movements in either direction, by means of tumble gears. The bed of this machine, which is of unusually heavy construction gives a travel to the saddle of 8 feet. The bottom and edges of the bed are planed parallel with the ways. The cutter head has an in and out adjustment of 4 inches for setting to the cut. The machine is operated entirely from the platform shown in the illustration; the controlling levers and starting rheostat being placed conveniently at hand.



A NEW ROTARY PLANING MACHINE.

One of the particular advantages of this machine is in the fact that there are no overhanging or protruding parts; the floor space being represented by the length of bed and the distance from back of bed to face of cutter head. The machine is built by the Newton Machine Tool Works, Inc., of Philadelphia.

The International Machine Co., Adrian, Mich., has secured an abandoned plant at that place in which the machinery for the manufacture of its fence looms will be installed. The company has an authorized capitalization of $75,000. F. E. Hook, is president and W. E. Cook, secretary.

The Peerless Gas Engine Co., of Chicago, has been incorporated with $25,000 capital to engage in the manufacture of gas engines, E. P. Caldwell, W. O. Wilson and A. J. Kotal are the incorporators.

The Cole Engineering Co., of Elizabeth, N. J., has been incorporated with $4,000 capital to engage in the manufacture of engines, boilers, etc. P. T. Norton, S. Koestler and S. W .Eldridge are the incorporators.

THE EFFICIENCY OF FUEL ECONOMIZERS.

BY GEORGE E. WALSH.

Very little actual data have been supplied to show the efficiency of modern fuel economizers, and those furnished have been for the most part imperfect and incomplete. The difficulty of doing this under conditions that can be generally obtained in a large number of plants is apparent to any one, and this is chiefly responsible for the lack of accuracy and completeness of detail. Yet the commercial value of modern fuel economizers depends upon their ability to perform actual, definite work.

The perfect fuel economizers must perform certain well-defined services in order to make them of value to the trade, and these are summed up in a few words. The first important duty must be the saving of fuel, and this should run at least from five to ten percent of the total amount of fuel consumed. In some cases the saving is considerably in excess of the latter percentage. Next to economy in the burning of coal or other fuel should come an increase in the steaming capacity of the boilers. This point is almost as important in many cases as the first, for when the boiler power of a plant is below that actually needed it is often possible for a fuel economizer to make up the difference so as to save the expensive installation of a new and larger boiler. Where the capacity is only from ten to twenty percent below the maximum capacity needed the fuel economizer should answer the purpose.

These are the two chief advantages obtained from the best fuel economizers of the day, but there are several minor gains, which in some plants loom up as important as those already mentioned. A properly set and arranged economizer should prolong the life of the average boiler, especially where the water power is drawn from dirty streams and heavily impregnated with mineral substances. Even the filtering of such water before passing into the boiler does not always remove the injurious sediment, but the fuel economizer helps partly to counteract the effect of the dirt on the boiler. Anything that will prolong the life of a boiler ten to twenty percent should represent a gain of no insignificant importance to plants where expensive installation always cuts down profits to a small figure.

The fuel economizer should be of great service in mills or factories where the full working capacity of the boiler is utilized at certain times, and when there is danger of an over-

load at critical moments. It is difficult under such circumstances to keep an even pressure of steam; but the fuel economizer holds in readiness a large volume of water above the boiling point, which can be called upon at any time, and thus the danger of sudden lowering of the steam pressure at critical moments is removed. There is also a certain saving in the handling of the coal and ashes, which is not always figured out. If the economizer saves ten percent of the fuel there is so much less coal and ash handled by the fireman, and in large boilers this at the end of the year will represent quite a little sum in labor saved.

The data furnished for users of fuel economizers indicate that the best of these devices last from 15 to 20 years in ordinary plants where the demands are pretty constant throughout the year, and where a fair amount of skill is shown in caring properly for them. The best economizers are built so that they will automatically clean themselves, and thus the danger from neglect is largely minimized, if not entirely eliminated. With an annual depreciation of five to seven percent there must be added from one to two percent for the cost of maintenance and repairs. These figures are the results of extensive tests in a wide number of large plants where the economizers have been subjected to conditions that would destroy them as quickly as anywhere else in the world. They represent therefore conservative estimates, and should prove too large for small plants where the demands on the economizers are comparatively small. For instance, in numerous plants where the mills are shut down for a part of the year, and where the furnaces are put out during dull years, fuel economizers have lasted 25 to 30 years, and they have continued to do good work at the end of these periods.

The actual figures of saving for any one plant must necessarily differ from those of another, for so much depends upon the design of the boiler and the installation of the economizer that it is difficult to make exact computations. Likewise in comparing any group of plants installed with economizers, it would be necessary also to take into consideration the kind of coal used. The heating value of coal, as well as its cost, cannot be ignored. These vary all the way from ten to one hundred percent. In one plant we will find coal costing $2 net per ton, while in others in peculiarly poor locations for obtaining coal the cost may run as high as $5 per ton. This latter figure is not unusual on the Pacific coast, and in many of the far Western States. Where this maximum figure is reached, however, liquid fuel has in many instances supplanted coal for all except ordinary auxiliary purposes. We find, therefore, with a saving of 10 percent in the total fuel consumed, the economizer shows gross returns on the investment ranging from 20 to 48 percent. The lowest figure represents the returns on coal at only $2 per ton, and the highest of the returns on coal delivered in the boiler house at $5 per ton. Consequently, the higher priced the coal the greater is the need of perfect fuel economizers. With coal furnished directly from the mines at nominal cost, the tendency is natural to ignore all attempts to economize in its consumption. It is a law of human nature to do this. With things costing little we are careless and neglectful, reasoning that they can easily be supplied with new ones at any time. It is only when goods are increasing in value that we begin to practice economy. Nevertheless, this law of human nature is false logic, and it has landed many a manufacturing plant into bankruptcy. The saving on small things is recognized today to be the secret of some of the greatest successes.

Now in regard to using economizers in plants where coal costs only $2 per ton, there is a saving that should in the end give it an immeasurable advantage over another not so provided. The gross return on the investment in the economizer is from 19 to 25 percent, and this can be further increased if the plant is run all the time. In fact, it is not difficult to double up this return by increasing the number of days of operation and also by lengthening the hours in each day of work. If we add to this gross return from fuel saving the advantages gained in having an even pressure of steam at all times, a lengthening of the life of the boiler, and an increase in its steaming capacity, we have an approximate value of the economizer as employed in the average steam plant.

But fuel economy enters so intimately into every line of industry today that new applications of it are being continually made, and in nothing is this more clearly shown than in the development of the fuel economizer. New applications of it and new improvements constantly add to its efficiency. Apart from its original purpose of saving heat from the waste gases from boilers, the economizer is being developed so as to save in other ways. In some plants the economizer becomes an auxiliary machine to do work that seems somewhat of a secondary nature. In some lines of work, such as bleaching, where live steam was formerly employed, the hot water from the economizers are now used entirely, while some plants utilize the hot water for heating, washing and similar purposes. In a plant where the hot water from the economizer is used for heating purposes instead of steam, an auxiliary pumping arrangement is attached, which carries the water from the cast iron tubes of the economizer and forces it into the heating pipes. After making the circuit of the heating pipes it returns again to the economizer to be re-heated, thus keeping up a constant circulation and wasting the least amount of heat in the operation. The water in making the entire circuit will lose from 30 to 40 degrees of heat.

In paper mills, bleacheries and cotton mills where hot water is constantly needed the fuel economizer is receiving special attention. The use of steam or hot water for washing bleachery goods, or for mixing the soda ash in the kilns in paper mills, as well as washing the ores in smelting plants, always represents an important item in fuel waste, which to a large extent can be minimized by the installation of a fuel economizer. The new application of the economizers for work that was not originally intended for them is one of the important developments of this type of boiler attachment, and this work certainly must be taken into account in any estimate of their efficiency. We find, therefore, a wide range of difference in their value, and where they have been adapted to some plant for auxiliary work, such as in a bleachery or paper mill, their saving is often so great that they are indispensable. The utilization of the waste gases from blast furnaces after passing through the boilers and economizers has effected a saving in some of the Pennsylvania steel mills that more than equals 20 percent on the first cost of the coal. The waste heat from rotary cement kilns has also been utilized by means of the fuel economizers with the result that quite a change has been produced in this industry.

In parts of Europe where garbage destructors are more in use than in this country, and where city departments receive nearly all their light, heat and power from the burning of the city's waste, the fuel economizers have been generally installed, with the result that an average saving of 20 to 40 percent has been obtained. The heating of feed water for the boilers, and supplying hot water for manufacturing purposes, are the two chief objects of the economizer, and these have attained such a state of perfection that few plants of any importance would attempt to do without them; but the question of further improving them, and of adapting them to new lines of industry, are matters of more general interest today, and they are practically being solved in ways that almost revolutionize some manufacturing interests. Upwards of many millions of dollars are now annually saved by the use of fuel economizers, but they have not by any means reached the end of their development and special application.

Westinghouse-Parsons steam turbines are to be installed in the new power station of the Union Metallic Catridge Co., at Bridgeport, Conn. The initial installation will consist of two turbo-generating units, each of 500 k. w. capacity. The two units will operate in parallel, and will furnish 440 volt, 3-phase current at 7200 alternations per minute for general power and lighting purposes in the various shops located within three or four blocks of the power station. The turbines will operate under 150 pounds steam, 28 inches of vacuum, and possibly superheat. The installation is in charge of Samuel M. Greene, of Holyoke, Mass.

The Georgia Iron & Coal Co., Rising Town, Ga., has purchased from the Allis-Chalmers Co., Chicago, a new 44 and 84 x 60-inch blowing engine. The Carnegie Steel Co., Pittsburg, has bought of the Allis-Chalmers Co., two blowing engines as follows: One 84 and 84 x 60 inches and one 44 and 84 x 60 inches.

THE BRISTOL THERMOMETER-THERMOSTAT.

The Bristol Co., of Waterbury, Conn., is placing a new instrument upon the market which has been given the compound name as above, since it is a combination thermometer and thermostat. An instrument of this character gives indications of the temperature of the atmosphere,gases or liquids at all times, and also serves as a thermostat to make electric connection at any predetermined limits of temperature for the purpose of operating controlling apparatus, alarms, etc. Fig. 1 shows an external view of the instrument which is provided with a six-inch scale graduated in degrees Fahrenheit. The construction and capabilities of this instrument will be

FIG. 1.—THE THERMOMETER THERMOSTAT.

best understood by referring to the interior view, Fig. 2, in which A is an arm pivoted at the lower portion of the case, terminating in a point resting on the arc of the graduated scale and is held by friction at whatever point it may happen to be set. Two adjustable contact pieces, B and C, are carried by this arm. These contact pieces are capable of adjustment by means of a screw D, which is threaded so as to cause the contact pieces to approach or recede at equal rates and distances from the center line of the arm A, upon which they are supported. They are also connected to binding posts as shown, which are used for making outside connections. These binding posts are located within the case to avoid any possibility of the wires or connections being disturbed without detection. Three holes with insulating eyelets are provided in the lower portion of case, as shown, for the insertion of connecting wires. The high and low

FIG. 2.—INTERIOR VIEW OF THERMOMETER THERMOSTAT.

contacts can be placed on a single or on independent circuits. The arm E, moving over the graduated scale, indicates the changes of temperature where the instrument is located. This arm is operated by a recording thermometer tube in the perforated protecting projection extending from the back of the case. On the back of the indicating pointer E there is a raised portion which makes electric connection with the contact pieces.

A novel feature of the instrument is that the temperature indicating arm E is not restrained by the thermometer-thermostatic contacts. Thus it will be seen that the controlling effect of the thermostat is perfectly adjustable as to position on the scale of the thermometer, and also as to high and low limits of operation, without in any way interfering with the correct indications of the thermometer in case the temperature does not remain, or is not controlled, within the limits for which contact pieces may be set. The instrument may be readily applied to liquids, as for instance, to indicate the temperature, and set into operation controlling apparatus for the brine in a refrigerating system or tank.

For temperatures above the atmosphere, as that occurring in ovens, kilns, closed spaces, or of liquids in pipes under pressure, a small bulb is located within the closed space or pipe. This bulb is connected with the thermometer-thermostat by a capillary tube filled with alcohol. The temperature at the bulb is communicated to the instrument which may be located at any convenient point for observation. The electric wires connecting with the adjustable thermostatic contacts may be carried to any point where the controlling apparatus may be located or where it is desired that an alarm shall be given.

From the foregoing description it will be seen that the instrument is flexible in its application and it is not improbable that other applications may suggest themselves which have not been thought of in connection with this description.

THE PERKINS SPRUE-CUTTING PRESS.

The Perkins Machine Co., of Warren, Mass., has a new sprue cutter for cutting off gates or sprues in a foundry,

A NEW SPRUE CUTTER.

whether brass or iron. This machine was built for the government and is made with electric drive. It weighs 2,800 pounds and will cut off a gate 1 inch in diameter. If the gates are flat it will cut off ½ x 1½ inches. The shaft is made of the new acid steel, which is the strongest steel yet devised for press work. The balance wheel is made so that the gear teeth are cut on the same, the balance wheel and gear being in one piece.

The press is operated by a 3½-h. p. Crocker-Wheeler 220-volt, fully enclosed motor. This press is so constructed that the operator can use long castings whether set square or at an angle to the main gate, and large castings can be cut off as easily and perfectly as those of smaller dimensions.

The opening between the standards not only admits light but allows the castings to be fed from front to back as well as from right to left.

A NEW PIPE THREADING MACHINE.

In the design of this machine especial attention has been given to the strength of the working parts. As these machines are subject to very severe strains and usually operated by unskilled labor, it is necessary to guard against many abuses. The parts must be simple in construction, and all operations must be easily performed. The head stock of the machine is made of a single casting, insuring rigidity as well as permanent alignment of all the bearings. The bed is very heavy and stiff and well braced across the portion over which the carriage travels.

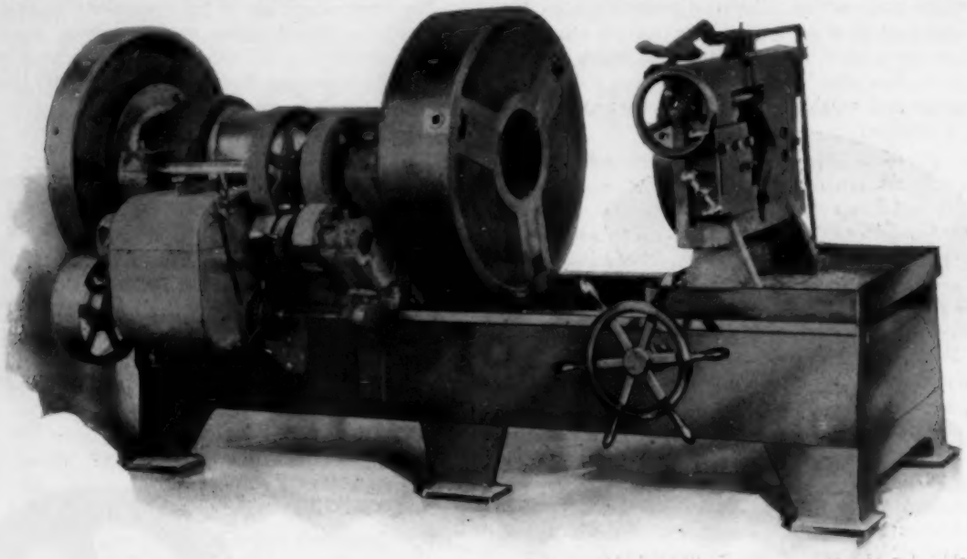


FIG. 1.—AN 8-INCH PIPE THREADING MACHINE.

The chucks, Fig. 1, are of the 3-jaw independent type, both front and rear chucks being provided with jaws for gripping the pipe. The faces of the slides are graduated and readily set to any particular size of pipe. Special grips for holding flanges or flanged fittings are placed on the slides of the rear chuck. By using these grips fittings can be made up on the pipe much more quickly than by hand and with a much tighter joint. The advantage of being able to grip the pipe at two places will be appreciated by users of these machines. The chucks are complete in themselves, and no face plate is necessary to make up the back of the chuck. The shells are single castings and consequently very stiff.

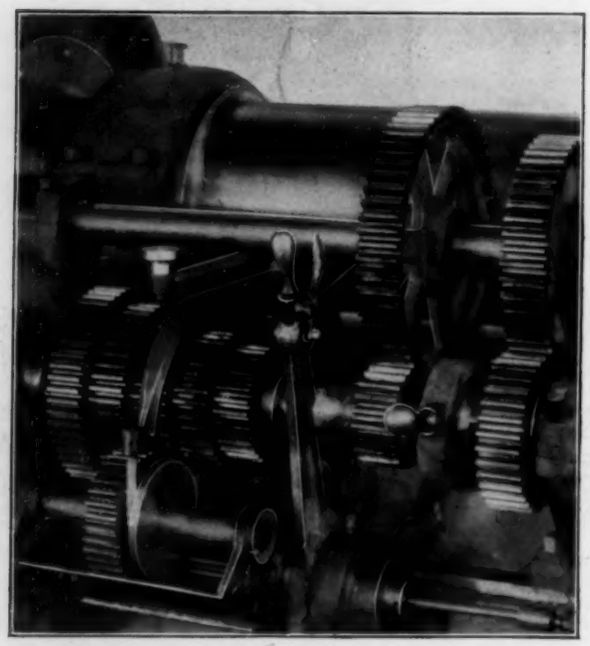


FIG. 2.—INTERIOR OF GEAR BOX.

The capacity of the machine is from 2½ to 8 inches inclusive, a separate set of dies being furnished for each size of pipe. There are, therefore, nine sets of dies sent with each machine. It is obvious that there should be at least one speed for each size of pipe, and the machine has been designed with ten speeds. These speeds have been arranged to be the proper ones for cutting the various sizes at the most economical point. In this connection this machine has a distinct advantage over the older ones, as the leading machines now on the market have but six speeds for the nine sizes of pipe.

The nine speeds are obtained through a gear box, Figs. 1 and 2, having five separate speeds, and a double clutch on one of the shafts which throws between two trains of gears having different ratios. This clutch is an improvement over the sliding gears that are commonly used, as the clutch will throw over at any point and gears will slide into mesh at only a few points.

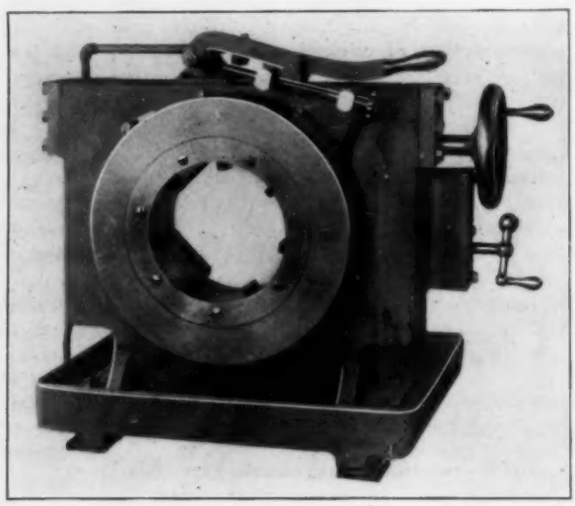


FIG. 3.—DIE HEAD AND ADJUSTING MECHANISM.

The pinion on the driving shaft has a face equal in width to the combined faces of the five gears on the cone, and a pinion meshing with this long one slides and revolves on a shaft which is held in a cradle which swings on the bearings which support the driving shaft. This cradle is keyed to the lever which runs up alongside of the gear box, and by throwing the lever in various positions and sliding the pinion along the shaft the pinion can be brought into mesh with any one of the cone gears. The sliding pinion is made with a flange

on one side to form a recess for the guiding pin. The two levers for sliding the pinion have a common pivoting point which is supported on the head stock of the machine. The cradle and shifting lever are supported on the brackets and not on the shaft, and the gear box is also supported on these brackets, which are keyed solidly into the bed. The box is arranged to hold about an inch of oil in the bottom and keep the sliding gear thoroughly lubricated. An oil cup on the side of the box prevents the oil rising up into the bearings, which are so designed as to throw back any oil which may run along the shaft. A speed plate is attached to the box,

FIG. 4.—CAM RING OF DIE HEAD.

giving the proper speeds for the various sizes of pipe and shows how to obtain them.

The advantages of driving with a single pulley are apparent. A constant belt speed is obtained which is designed for the maximum work, the machine can be placed either in line with, or at right angles with the countershaft, and a motor can be attached in the simplest manner, using a constant speed motor which is the cheapest of the various types. The use of an internal driving gear instead of the usual spur gear adds to the appearance of the machine as well as to its safety. It also allows of obtaining the same ratio of gearing and yet brings the gears closer to the body of the machine. It will be noted especially that all of the gearing can be quickly removed from the machine without disturbing the other parts. This feature is an important one when possible accidents are considered. The internal gear has a guard along ends of teeth.

In the die head, Fig. 3, some marked improvements have been made. The cam rings used in the present machines are of cast iron with the cams cast with the body of the ring. This design is very good as long as the cams retain their original form, but the chips from the pipe work down into the ring and wear the surfaces of the lower cams. This causes the lower dies to drop out of line with the upper ones and the latter do all of the cutting. It often impossible to repair the ring and a new one is very costly. In this machine the cams are made of steel, hardened, and inserted in the ring. They are interchangeable in the same ring, and on occasion can be replaced at a very small cost. This improvement will prevent the dies from losing their gauge and as a precaution to prevent their getting out of lead, which always means a stripped or double thread, the bottom of the slots in which the chasers travel are formed by hardened steel plates. As the face ring on the front of the chaser holds it against this hardened plate there is but little chance of getting out of lead.

The cam ring, Fig. 4, is from a 12-inch machine, but is the same in construction as the one used on the 8-inch machine, the difference being that the 12-inch ring has nine cams and the 8-inch ring seven cams. The cams, Fig. 5, are made from forgings and hardened after being finished, making them practically indestructible. They are held in the ring by bevel keys which are held by filister head screws through the outside of the ring. These keys draw the cams tight against the body of the ring and hold them firmly in place. The dies are removed from the head through the center, when the head is expanded to its extreme limit. Spring pins are placed in the sides of the upper cams to prevent the upper dies from falling out, these pins engaging in the slots of the dies as they disengage from the adjoining cams. A slight pull on the die will release it from the pin.

The chasers are made of single pieces of steel. There are no pins or links to become loose or to be replaced. These chasers are cut one at a time in a special machine. There are seven to each set. This method of cutting not only reduces the cost of manufacture, which reduces the price to the user, but allows of any single chaser being replaced in a set without regard to the balance of the set. This is of great advantage to users living at a distance from the factory.

The adjusting mechanism, Fig. 3, is an improvement on the old lever type. The improvement consists of the placing of the hand nut on the adjusting screw on the side of the machine directly in front of the operator, and the reversing of the leverage to bring the lever to rest on the screw, thus maintaining the straight line adjustment and preventing the digging into the thread before releasing, which is one of the faults of the old mechanism. The adjusting screw shown was made with a long thread for experimental purposes. In actual practice about half the screw is threaded and the lever bears on the smooth part of the rod.

A rotary geared oil pump is driven from the driving shaft of the machine and the oil is piped directly to the dies and cutting off tool which is held in a slide on one of the steady slides. The pump is driven direct from the shaft without the use of a chain or belt. The oil is held in the bed of the machine directly under the carriage, and the bed is so constructed at this portion that only a small amount of lubricant is required.

The countershaft has two friction pulleys 14 inches diameter for 4-inch belt. One of these pulleys can be used for a reverse or for additional speeds. The machine weighs 6,000 pounds with countershaft and dies.

These machines are now being made in three sizes: 1 to 4 inches; 2½ to 8 inches, and 4 to 12 inches respectively, by the Stoever Foundry & Mfg. Co., of Myerstown, Pa.

Woolley Foundry & Machine Works, Anderson, Ind., makers of gas and gasoline engines, have booked more orders for the Burger gas engines in the past month than in any month in the last two years, and the company expects 1904 will be the banner year in its history. Shipments were made,

FIG. 5.—CAMS, BEVEL KEYS AND CUTTERS OF DIE HEAD.

among others, of one 40-h. p. automatic engine to the Smith-Hubbard Lumber Co., Wabash, Ind.; one 40-h. p. engine to Browning & Co. Flouring Mills, Alexandria, Ind., and one 40-h. p. engine to the Hollensbe Store Co., Westport, Ind., besides several engines of smaller units.

The Border Lock Nut Co., Richmond, Ind., will erect a plant 40 x 100 feet and will install a large amount of machinery for the manufacture of its lock nuts. The company is capitalized at $30,000.

A Rational Basis for Wages.*

BY HARRINGTON EMERSON.

Both the coal operator and the wage earner know better what they are selling than the average manufacturer knows what he is buying, whether coal or labor, and as a consequence the latter usually has the worst of the bargain, which is wholly his own fault. I couple coal and labor because there is much ultimate similarity between them as objects of contract. The coal operator aims to sell tonnage. He owns a mine, whose quality he cannot change; he mines by the ton; he pays freight by the ton, and if you will let him, he will sell by the ton, persuading the railroad, factory purchasing agent or other customer that coal is coal; no difference except in his price, which he is willing to shade a little below that of competitors. The purchaser who knows his business is not deluded by a ton price, particularly not if he is running a torpedo boat or cruiser on a premium trial trip. He buys what scales do not weigh, namely *power,* and if the factory manager can get power by the metered kilowatt he will forget all about coal. If he cannot obtain measured electric power or water power, he must create his power by means of a heat engine, and here again he is lucky if his fuel can be metered to him in cubic feet of natural gas, or in barrels of crude oil, both of these substances having a very accurate number of heat units, for the gas, per cubic foot at constant temperature and pressure; for the oil, per gallon or pound.

In comparing the relative value of coal, oil or natural gas, the consumer can only be guided by the cost in dollars of brake horsepower, and if he is wise he will purchase coal, by the ton, perhaps, but strictly on a basis of dollars per thermal units. When a ton quotation is made, the sensible purchaser adds to the delivered price the cost of unloading, shrinkage, cost of delivering to furnace room, cost of removing ashes, thus obtaining the total cost of the coal as used in the furnace. He will then analyze the coal, make a calorimetric or experimental test of its heating value and thus determine the relative cost of the heat units in the coals offered. If he does this he will invariably find that the best coals are the cheapest. It costs on the average no more to mine poor coal than to mine good coal, probably not as much; it costs no more to carry to market good coal, and the man operating a seam of good quality is just as anxious to increase his tonnage, and thus add to his margin of profit, as the owner of a poor seam. As the majority of dealers and purchasers make but little allowance for difference in heating value, the owner of the best seams has to shade his price almost or quite to the level of the price of the poorer coals of his competitor for *tonnage.*

Within the last year I have seen a large concern buy at over $6 a ton, imported English coal of 11,000 British thermal units—coal with which steam could not be maintained, and later in the same year this firm made chemical analysis and calorimeter tests of coals offered, securing for $3.10 a coal of 15,300 British thermal units. The first coal was bought because at the time it seemed cheap per ton; the second was boughtly solely because it was low in price per heat unit. It is evident that two coals do not always have the same relative value at different places. At Nome, in Alaska, I have seen coals sell at $75 per ton, owing to the cost of transportation, the expenses of landing, of carrying inland, of dealers' profits. If, in a camp near Nome, a coal of 10,000 British thermal units is worth $75 a ton, then a coal of 15,000 British thermal units is worth $112.50 a ton. Deduct from both the cost of delivery from Seattle to mine, say $71 a ton, and it becomes evident that the purchaser should not have hesitated to pay if necessary $41.50 for the better coal rather than $4 for the poorer fuel. I knew but one man at Nome far-sighted enough to realize that what he was paying for was heat units, so he imported and used crude oil.

At the furnace door the connection between dealer and buyer ceases. After having sold British thermal units, the dealer is not further concerned as to what use the buyer makes of the coal. One buyer will put in the best boilers he can secure, install a condensing, triple expansion engine and obtain a horsepower from one pound of coal. Another buyer will with the same coal be content to obtain a horsepower for seven or eight or even more pounds of coal. In the economical consumption of coal *three* considerations enter: The market price per ton; the quality of the coal; the efficiency of use; and all three must be considered to obtain heat units cheaply.

Prices are quoted per ton to the purchaser, who should determine qualities and buy on a basis of heat value and not of weight, and finally he should use what he has bought so as to obtain highest results. What would we think of the dealer who demanded a higher price per ton because the purchaser had better boilers and engines? Yet, on the other hand, the dealer is debarred from asking a price based on his heat units because his mine conditions and competition force him to sell by the ton. The buyer, not the seller, is in the stronger position. In contracting for labor the manager should consider it just as he does coal and buy it in the same rational and unusual manner. The wage earner, like the coal operator, is forced to sell what he always has; namely, time. The employer, who is not interested in fuel tons, is also not interested in the wage earners' hours and minutes, but solely in low cost of production, and this he can only secure through the quality and efficiency of the labor he employs, only indirectly and remotely from the hours the employe gives him. The wage earner is not selling *output,* nor is the employer buying *output,* and any attempt to base wages on *output* is as irrational as to base the price of coal on boiler and engine efficiency.

There was a time when labor was in a condition of status. The worker was entitled to a living more or less generous, and under pressure he turned out more or less work, just as sheep pasture their owners' ranges and peacefully submit to a shearing. By political economists and students of sociology the substitution of contract for status has been heralded as a great advance, just as the substitution of coal bought by the ton for wood gathered without measure from the forest was an advance. Under contract the wage earner is supposed to receive an agreed upon wage and to render a definite service, just as the ton of coal is supposed by those who know no better to be a definite measure of heat supply. This crude basis of demanding a surrender of time and leaving the particular service to the whim of the employer worked fairly well with certain passive services, in which time rather than effort and intelligence constituted the equivalent. Time reward was probably originally based on military or naval service, in which long periods of idleness alternated with hours or days of frenzied effort, much as firemen are employed today—a profession in which pay cannot be gauged by performance. It is also probable that many of the earlier wage earners were employed more for the sake of ostentatious display than for what they produced, survival of which we still see in the barbaric splendor of two postillions, a coachman and two footmen, all in gay livery, taking one poor man or woman driving. It is time the industrial world moved away from such prototypes, whether military or ostentatious, and by advocating an entire departure from the military type of management for factories our honored member, Mr. Fred W. Taylor, plans a reform far reaching and deep.

Military and naval idleness, ostentatious time-serving, are not wanted in modern intensive production, and anything of the kind should be more obnoxious to the self-respecting producer, who is directly debased by it, than to the employer who cannot help but feel in a measure exalted by considering himself a captain of hundreds or of thousands. I have heard that in England a manufacturer who employs a thousand men can find admittance to gentlemen's clubs, but the man who employs less than the magical number 1,000 cannot. It would follow that if a non-progressive father bequeathed to a progressive son an establishment with 1,000 employes, and the latter was able by the introduction of better machinery and modern methods to turn out more and better work with half the men, even though he doubled their wages, he would be-base himself socially.

There is a mental laziness in talking about dollars and days as if either were a humanly measurable quantity. The cost of living may go up or down, and I have heard men say that

*Presented at the Chicago meeting, June 1, 1904, of the American Society of Mechanical Engineers.

there were certain five minutes in their lives which they would not exchange for other months. When the wage earner sells time the employer does not necessarily obtain anything, not even as tangible an asset as a ton of very poor coal. Just as the coal operator has foisted tonnage on his client, so the foolish employing class has forced the wage earner to foist *time* on his employer, time of no value in itself, and the employer blind to the essentials of the transaction builds up an elaborate system of time checks and time keeping (both of which are merely incidentals and not essentials in good system) to the utter neglect of matters much more important.

Some thinking employers, realizing that *time* in itself had no value, have endeavored by means of piece work to buy *output*.. The analogy of coal has already shown that *output* does not enter properly into the contract between employer and wage earner. When he sells his time, the wage earner does give something of value to himself, even if it may have none for his employer, but he can no more accurately and justly sell output than the coal operator can sell horsepower from a boiler and engine over which he has no control. It might on occasion be convenient temporarily to measure the merit of the wage earner by his output, just as it might be convenient to measure the value of a coal by the horsepower obtained from it in a given power house, but the moment a new power house is put up, the moment a wage earner is coupled up with better facilities, the purchaser falls back on the market price of coal and on the market price of skilled labor. In buying coal the wise purchaser was advised to buy by the ton, to base his price on quality and to use efficiently. He should act similarly when he buys labor.

It is perfectly possible to find an equitable basis for reward, at once just to the employer, who wants something more tangible than the abstraction *time*, and to the wage earner who is already too precariously dependent on uncertain wages, when what he really wants is a steady living. The wage earner, like the lawyer, has four different things to sell: His time and liberty; his skill, profession or trade; his intelligent co-operation; his power to do harm. Output is not among these nor is it, except in rare and general distressing cases, like sweat shop work, what he does or can sell.

The Triple Wage.

A living daily wage is due to every man who signs away his liberty to another, whether he stands around idly to glorify his employer or to amuse himself. This minimum wage is a matter of contract. It should be due the man whether he is present or absent as long as he remains on the pay roll. This is the wage payable as equivalent for assignment of time and loss of liberty. This part of compensation I shall call minimum wage. Above this minimum he should receive when at work at his trade a different and larger sum, equivalent to the current wages of his trade but in reality made up of two distinct parts, namely, the minimum wage and an increment due to him for his profession or trade. We have in this the basis of the present daily wage system relative to time. Beyond this, however, for future just and peaceable relations between employer and employe, comes the most important part of the wage earner's reward, namely, what is due him for exceptional and unusual co-operation either of mind, body, or both. I believe that in the old days of privateering the sailor who first sighted a vessel subsequently captured was entitled to special prize money, and in war, actions of exceptional personal gallantry are specially rewarded.

From the nature of the case this third increment of wages, corresponding to the contingent fee of the lawyer, must be fluctuating, payable some days and others not, because earned some days and others not. In many cases the earning of this professional wage does not imply harder or most exhausting work, but more intelligent and co-operating work. It implies use of heart and head in addition to use of hands and eyes. We might say that these three forms of wages are paid respectively. For use of body; for use of hands and eyes, and for use of head and heart.

It is foreign to this paper to discuss the fourth form of wages due to the ability to do harm. This wage may be no better than the extortion of the blackmailer or the ransom of the brigand, or it may be as legitimate as the fee paid a lawyer to keep out of a case. As the state fixes the minimum age and the maximum hours at which children may be employed, it might also, at least by example, fix the minimum living wage below which no one should accept employment, and thus fix a minimum standard. Supply and demand, modified by some extent by the unions, will determine the second wage, and the third is a matter to be left wholly to employer and employe, even as are today lawyers' and doctors' fees. The employe has everything to gain by a system of strict and accurate records which will enable him to establish his own value and worth, and on the basis of which, if he changes location, he may be eagerly sought elsewhere. Whoever heard of a lawyer, when he moves to a fresh location, taking with him from the mayor of his old town a certificate that he has left honorably? The official court records show whether he has won cases or lost them; whether he has been a blackmailer or faithful to his clients. Why should not the machinist going to a new location say: "Here is the record of work I have done. I know so well how to do what is wanted; to combine machine performance with best cuts, feeds, speeds, as to lower materially the average cost of production of any operation I undertake. I expect, firstly, current machinists' wages, and, secondly, I expect so much more for my special skill."

The Locomotive Engineer as an Illustration.

The theory and application of triple wage can best be illustrated by a concrete example, for which I shall select the case of a locomotive engineer—a man belonging to one of the strongest and most conservative unions, receiving high wages owing to long training, special skill and great responsibility. Such a man should be allotted a fixed daily rate of minimum wages, to be paid whether he runs or not, whether he is sick or well, whether he is suspended or in good standing. The amount of this daily wage is determined by agreement at time of receiving appointment. Secondly, under the usual terms of his own or his union's agreement with the company, he receives when on his runs definite and agreed upon compensation due to him because he is an engineer in charge of a train and under orders, whether standing on side track or running sixty miles an hour. There is, however, a great difference in engineers and in firemen, who should be jointly considered with engineers. One engineer and his fireman will send into the shop in short time every engine they run on. Another engineer and fireman succeed in getting the utmost out of their engine even under the most trying conditions of service. It is just here that the difference comes in between man and man for which at present there is scant, or no recognition, a difference that corresponds to difference in heat units of coals.

In one of the largest of American railways the cost per mile for wages of engineers, firemen and wipers, the cost per mile for coal and the cost per mile for locomotive repairs is practically the same, being respectively $.0946, $.0999 and $.0867. This is an average for the whole road, but for the heaviest engines both repairs and fuel are relatively greater. It is in the second and third items that there is abundant opportunity for railroad companies and their engine crews to combine to effect a saving in which both are to share, and the relative rights of each party are not to be guessed at or conceded as a gratuity or bonus, but are to be based on scientific detail study as reliable as the determination of heat units in coal or the efficiency of a boiler or engine. What encouragement is there to an engineer to work and toil over an engine that some other engineer has shamefully neglected? What encouragement is there to him to try to put an engine into the best of condition if the next man that takes it will allow everything to run down and go to ruin?

An engine costs twice as much today as a few years ago, and four times as much is expected of it The wear and strain are in every way greater, and the repairs have become more costly. It is easier by omission of unusual care to cause damage, more expensive to make it good, yet these new conditions have not been met by any corresponding change in the relation between employer and employe. I leave to others who know more about this particular subject of engines than I do to evolve an equitable basis of mutual gain to both parties. I can imagine, however, that it might be possible to give the

man with the best record the pick of certain engines, the selection of his own fireman, and in addition to paying him by the day and by the regular run basis, to give him an ever-increasing rate in proportion to the number of miles his engine runs without getting into the shop. When at last the engine has to be sent there he is laid off on the day wage basis, possibly with the privilege of superintending the repairs, until it goes into service again. I can think of other methods of accomplishing the same desirable end; namely, securing the earnest, constant co-operation of those in charge of the engine, in keeping it in good repair. Companies know the average run of their engines, the average cost of repairs per mile run, the average earnings of the engineers and firemen. All the data are at hand to put into effect the three rates of wages.

It will at once be objected that engines must be pooled in order to make more miles than they will if assigned to one crew. This objection may be urged against this particular example, but not against the principle urged, yet even for the example no one who has not studied the subject thoroughly and exhaustively has authority to speak with finality. I know of no data available. It is a curious fact in railroad and other machine shops that clerks and facilities are lavished for *money* accounting but elementary help begrudged for shop records; also that betterments and improvements that would yield 100 percent profit on their cost are not made simply because the records *pro* and *con* do not exist. It would be possible to work out this engine crew problem so as to obtain maximum of engine service, maximum care of engines, maximum wages to crews, minimum of repair costs and lessened expense to companies. On large ocean steamers engine crews alternate, not promiscuously but definitely, and on a railroad there need be no hard and fast rule one way or the other, but a scientific adjustment of equipment to conditions, so that some engines would have only one crew, other two engines have three crews, with chief engineer, and first and second assistants, and some few emergency engines have no regular crews. These matters require trouble and study, but so does the running of trains on time. The latter part of railroad operation has reached a high state of perfection, but the adjustment of engineers, engines and company interests to one another is as yet very elementary.

A system that is applicable to engineer and fireman is also generally applicable to other craftsmen. It is a principle I advocate, not an isolated case, each one of which will vary in method.

How to Get Low Production Cost

There are only two ways of obtaining the lowest cost of production: First, a relentless and ceaseless study and direction of details by the officials who plan and control, and, secondly, an intelligent and eager co-operation of the employe, which cannot be equitably asked for without generous special compensation. It is simply a question of what is most profitable. In industrial matters, whether production or wages, there is no possibility of permanent stagnation. Whether we export or import, whether we depend on home markets or on colonies, prosperity is ultimately based on the world's crops, and these depend on the variable rains from heaven. There are fat years and lean years, and it is only such a one as Joseph who is able to use the fat years to corner the grain market and the lean years to enslave the Egyptians forever. When work is abundant, employment increases, wages rise; when work is slack, employment decreases and wages fall, a double loss to the wage earner—dearth of employment being far more serious than lower wages, and in this respect the census and other reports dealing with rise and fall of wages have been most misleading. The question is only very slightly whether the average wages per year of those actually employed are higher or lower, but whether more or less are employed in their own trades at reasonable wages.

It is a reflection of the intelligence of the state that when so much is done to correct nature, to dredge harbors, build sea walls, impound waters, regulate rivers, fight against diseases; when so much more is meddled with that might be better left alone, absolutely no use is made of the great power of the state to act as a flywheel for the energy of production. Here at least is something in which the interests of employers and employes are one. When labor is scarce and materials high, governments, national, state and municipal, should carefully abstain from undertaking great works of creation or improvement, but when labor is plentiful and materials low in price governments should carry out plans held in reserve for just such conditions. There is no other means at once so powerful and economical to minimize the ups and downs of both labor and capital. It is in the power of government to establish a minimum wage (as well as a minimum price for great staples) at which it is always ready to undertake great elementary works of public utility—dredging canals, for instance, or opening roads.. In some such manner as this would I have the state take a hand in helping to fix the minimum wage. On the other hand, every wage earner should keep constantly in view the possibility of obtaining a much higher rate than the average; a rate wholly due to his own reputation and accomplishment; a rate far above the minimum offered by government, also much above the mean due him as an able-bodied, skilled, trustworthy craftsman. This extra rate must always be based on the fact that he is more skilful or valuable than the average. He may be more skilful today, just as a prize fighter may be the champion of the world today, but next year both may be no more than mediocre. He must constantly excel if he would constantly command a professional price. It is, however, not necessary to wait for the slow action of an unintelligent and unmindful government. Every employer can test the cost of production as he can the cost of horsepower, and he should make it his business to know what he can afford to pay for quality; and the employer who systematically seeks quality will find that the best coal and the most efficient labor sell for less than their relative worth. Believing as I do that the man, machine and method efficiency of the average railroad or machine shop is far below what it might be, often not more than one-third to one-half of the ideal, I cannot but regard disputes over wages as the effect rather than the cause of unsatisfactory and unscientific relations between employer and employee. If the employers had been wiser there might perhaps never have been any union antagonism, only reasonable bargaining as there is today between lawyer or doctor and client. It is the employe's privilege to try to obtain higher wages and shorter hours, but not as an inducement to offer less work, nor yet, perhaps, more work, but *better work*, a more efficient combination of man, method and machine.

Trade Publications.

The Indianapolis Switch & Frog Co., of Springfield, O., in recent printed matter illustrates its light rail frogs and switches, which are designed and constructed on the same general lines as its standard railroad track work. The work shown is such as is installed in mines, quarries and other industrial operations. For sections of rails lighter than 16 pounds per yard, which will not admit of bolts and filler, and for heavier sections when desired, the manufacturers furnish their plate frog in which the base of the rail is securely riveted to a steel plate.

A miniature catalogue of the Rand Drill Co. presents reduced illustrations and condensed details of its standard types of air and gas compressors. In connection with each description reference is made to the larger catalogue in which the particular compressor is more fully described.

The Power Specialty Co., 126 Liberty street, New York, manufacturer of the Foster superheater, has opened an office at Room No. 305 Monadnock block, Chicago, (telephone Harrison 4433). This office is in charge of Alexander Bradley, who will give careful attention to all inquiries in that territory.

The Sidney Tool Co., Sidney, O., recently incorporated, succeeds the Defiance Tool Co. in the manufacture of power and hand drills, band saws, blacksmith's forges, butchers' and carriage makers' tools. The company will buy some new machinery and the balance will be moved from the Defiance factory.

SEPARATE COMBUSTION CHAMBER FOR STOVES.

Several designs of independent combustion chamber for hot-blast stoves have been patented recently by A. P. Gaines, of Birmingham, Ala., and one of these is shown in the accompanying illustrations. The object of the invention is to provide a combustion chamber which shall be entirely separate and independent from the stove or regenerative chamber, so that when the stove is on blast the air blast can pass only through the stove and never through the combustion chamber. It is claimed this construction will be more efficient and durable than those hitherto used. As is readily apparent the independent combustion chamber shown in the drawing is applicable to almost any design of stoves now in general use, particularly the one and two-pass stove, and that as the operation and principle are very similar a detailed description is not necessary. The claims made by the inventor are as follows: First, large heating surface per cubic contents of stove; second, more perfect combustion of gases; third, more uniform temperature; fourth, cheaper construction per square foot of heating surface obtained; fifth, cleaner stoves, therefore more efficient heating surface; sixth, longer life to stove, and therefore less repairs and more continuous use of stove; seventh, easier and cheaper repairs; eighth, longer life to hot blast valves and hot blast connections. Mr. Gaines writes of the problem he has sought to solve as follows:

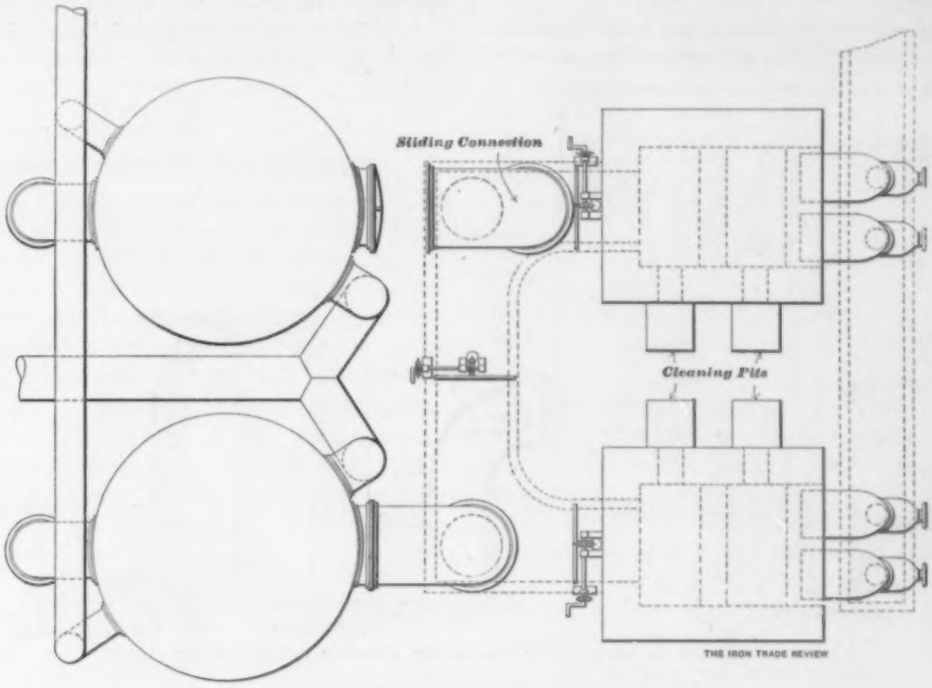


FIG. 1.—PLAN OF GAINES INDEPENDENT COMBUSTION CHAMBER FOR HOT BLAST STOVES.

"In hot blast stoves for furnaces it has been the common practice to form the combustion chamber within or as a part of the hot blast stove. In such construction considerable heating area is lost by the opening or space required for the combustion chamber and for the heavy walls necessary, such chamber or space generally extending the full height of the stove and free of checker work and diminishing to this extent the heating surface of the stove. By providing a separate combustion chamber the same area of stove will present a considerably greater heating surface, as the space and heavy walls can be filled with checker work.

"Again the cold blast of air passing through the combustion chamber reduces the temperature to a low degree, thereby requiring considerable time to heat the brick or other heating surface in the combustion chamber sufficiently high to insure perfect combustion of the gas. By the use of this invention the separate combustion chambers and stoves may be so connected that any one combustion chamber may be used with two or more stoves at any one time; consequently when one stove is on blast the other will be on gas, thereby securing continuous passage of gas through the combustion chamber and maintaining the highest temperature in this chamber at all times. This insures more perfect combustion of the gas, the only loss of heat being that due to radiation from the walls of the combustion chamber and gas connections to stoves. Again, as the repairs on the modern hot-blast stoves are required, very largely if not entirely, in the combustion chamber the provision of an independent and separate combustion chamber for each stove, with each combustion chamber connected to two stoves, obviates the frequent withdrawal of the stoves from service. When repairs are needed in a combustion chamber in active service, the extra combustion chamber can be put in service and there will be no interruption of the service of gas through the stove. The frequent necessity of repairs to the combustion chamber is due to the fact that when the best combustion is attained the temperature is so high as to affect the fire brick to a certain extent. This action is further increased by the fusing together of the lime dust and other material mechanically held in the gas and the fluxing of said fused materials with the fire bricks of the chamber. When, therefore, such repairs are necessary, it is far less expensive and less difficult on a separate combustion chamber than on one contained in a stove. Moreover, as the separate combustion chamber can be provided with means for precipitating dust and dirt carried by the gas before it reaches the stove, the stoves are kept practically free from such dust or dirt. The stove itself is left in service longer, and as this foreign matter is a poor conductor or heat absorber the heating efficiency of the stove is materially increased. And since the blast does not pass through the combustion chamber, when built independent, it need not be expensive in construction for it will not be necessary to inclose it in an air-tight sheet iron casing capable of retaining a pressure of from 15 to 30 pounds to the square inch, as in the stove proper. A simple wall capable of preventing expansion by the high temperature is all that is required, combined with simple means to prevent heat radiation.

"Referring to the gain in heating surface: Figures have been presented lately of a one-pass stove, in which the combustion chamber was located in one end of the stoves, and this was compared with some of the most popular two-pass stoves. If these figures are correct as regards a one-pass stove as against a two-pass, they would be even more decided in favor of the independent combustion chamber which has no area of the stove proper wasted by such a space. In the particular cases which were taken of these two types of stoves a gain of 41 percent of heating surface per foot of height was claimed for the one-pass over any of the two-pass stoves of equal diameter. In other words, in one foot of height through the checker work of two of the well known two-pass stoves

showing 375 square feet of heating surface, the single pass stove showed checker work equal to 530 square feet. It was further shown, assuming that there should be one square foot of heating surface to one cubic foot of free air to be heated, that a single stove of this style can be made to accommodate 40,000 cubic feet of engine air within the limits of a shell 20 feet in diameter by 82 or 83 feet in height, and three stoves can thus be made to do the work that would call for four of the common type. This, too, with all the chances in favor of less time being required to heat the stoves and therefore a more uniform temperature maintained, which is of the greatest advantage to the furnace.

"Second, as to the gain in efficiency by reason of cleaner stoves: There have been considerable claims made recently for the better efficiency of the stoves by reason of clean gas in connection with washing and scrubbing the blast furnace gas for gas engines, one authority claiming a gain of 30 percent. It was not stated whether this figure considered that in the passage through a gas scrubber there is considerable water carried along in the shape of fog and moisture, and that this moisture must be converted into steam in the stove or in the boiler. Again, it will be interesting to consider the loss of heat to the stoves by reason of the necessary resulting loss of sensible heat by the scrubbing or the washing of gas.

"Campbell shows in his 'Manufacture and Properties of Iron and Steel' that in round numbers a furnace making 300 tons of pig iron per day will receive 19,700 cubic feet or 558 cubic meters of air per minute, equal to 803,503 cubic meters per 24 hours. It will produce 3,551 cubic meters of tunnel head gases per ton of pig iron, equal to 1,065,000 cubic meters in 24 hours, and about one-third, or 355,000 cubic meters, of this gas will be sent to the stoves. Assuming that the gases from the tunnel head enter the stoves at 300 degrees F. (a low average temperature for general practice), the total calories per 24 hours carried to the stoves by the sensible heat will be 19,312,000. Taking the calorific value of the gas at 823 calories per cubic meter the theoretical value of the gases to the stoves in 24 hours will be 292,165,000 calories—a total of 311,477,000 calories, the sum of the calories developed by the combustion of the gases and the sensible heat, which figure would show the sensible heat to be about 6 percent of the total calorific value of the gas.

"Campbell further shows that while the gas furnished the stoves has a theoretical heating value of 292,165,000 calories the heating of the blast calls for only 153,358,000 calories, showing an efficiency of 52 percent. This low efficiency of the use of the gas in the stoves is readily accounted for by the inspection of his tables (page 109) 'Data on Products of Combustion,' and shows conclusively that it comes in a large measure from incomplete combustion and the presence of a large quantity of dust in the stoves which prevents absorption of heat, and permit the products of combustion escaping at a high temperature. It would not, therefore, be unreasonable to suppose that by having cleaner stoves and more perfect combustion, at least it would be possible to attain 40 percent better efficiency, or a saving in 24 hours of 116,866,000 calories—by no means a small item to be lightly passed over, but one that should be given its proportion of consideration along with the modern blast furnace gas engines.

"In the design shown herewith it will be seen that a large portion of the combustion chamber is made up of flue area and below ground. This has its advantages over some of the other designs as it materially reduces the space occupied above ground, giving more room and better passage ways about stoves. Again, being under ground permits of less chance of loss of heat by radiation and at the same time gives strong construction.

"Two gas valves only are shown to each combustion chamber, but no doubt more efficient results could be obtained by materially increasing this number, and as the gas valves do not have to be closed and opened at each change of the stove from blast to gas there will be no loss of time or extra work required. Attention may be called also to the Spearman burner connecting the combustion chamber with the stove. The nozzle has first a heavy backing of asbestos brick next to the casing to prevent loss of heat by radiation, and inside and next to the asbestos brick the fire brick are placed.

"The burner, unlike the general burner of this type, has no air space around the nozzle when the gas is directed to the stove, but has the nozzle bolted air tight against the opening in the stove. The seats, slides and gear frames will have to be water-cooled and preferably made of bronze."

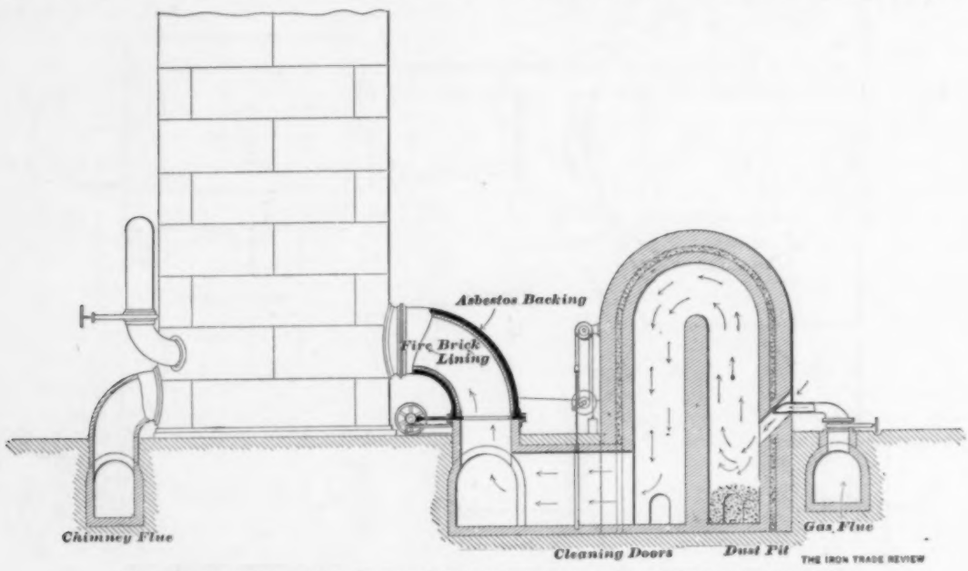


FIG. 2.—SECTION OF INDEPENDENT COMBUSTION CHAMBER FOR HOT BLAST STOVES.

At the annual meeting of stockholders of Iroquois Iron Co., Chicago, held May 20, the following board of directors was re-elected: M. Cochrane Armour, William A. Rogers, David B. Gamble, Archer Brown, Geo. A. Tripp, Charles B. Shedd, Samuel A. Kennedy. The directors elected the following officers: President, M. Cochrane Armour; vice president, William A. Rogers; secretary and treasurer, Geo. A. Tripp. The usual semi-annual dividend of 5 percent was declared.

A receiver has been appointed for the Omega Steel Co., of New Haven, Conn. The liabilities are placed at $11,000 and the assets are a few hundred dollars below that figure.

At a meeting of the stockholders of the Ramapo Iron Works, Niagara Falls, N. Y., held last week, directors were elected as follows: F. W. Snow, W. W. Snow, R. J. Davidson, John M. Van Winkle and W. B. Rankine. The following officers were elected: F. W. Snow, president; W. W. Snow, vice president; R. J. Davidson, secretary.

After an idleness of nearly two weeks the 40 and 48-inch plate mills and the rail mill of the Cambria Steel Co. resumed operations again late last week. A number of departments however continue idle, and it is the policy of this company to shut down a plant as soon as orders are not sufficient to keep it in full operation.

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JUNE 2, 1904

APRIL IRON EXPORTS SHOW A DECREASE.

There was a drop of 20,000 tons in our exports of pig iron, crude steel, steel rails and wire rods in April as compared with March. In the case of rods the decline from 3,035 tons in March to 37 tons in April is doubtless due to the vicissitudes of the relations between the principal American producer and the Canadian makers. In the case of billets and rails the declines were simply due to a lack of orders or specifications. Below is given a table showing the movement of these important commodities since the first of the year, before which date the exports were inconsequential:

EXPORTS IN 1904, GROSS TONS:

	Pig Iron.	Steel.	Rails.
January	6,742	1,860	1,740
February	3,429	26,205	8,465
March	3,954	36,908	17,873
April	2,898	28,276	10,460
	17,023	93,249	38,538

The decline in the heavy lines from March to April was partly made up by increases of 1,000 tons in steel bars, other than wire rods, of 2,000 tons in structural material, and of lesser increases in sheets, tin plates, etc., so that the total tonnage decrease was only 13,916 tons from March to April. There is, however, not a great deal of consolation in the record for April. The total tonnage of all iron and steel material exported in four months this year has been about 272,000 tons, or at the rate of 816,000 tons annually, while the April exports alone were at the rate of 900,000 tons annually. If the regular exports which have been a feature of the trade for years were deducted, the total would be still less pretentious, since the excess of our exports in the first four months of this year, over the tonnage in the same months of last year it only at the rate of about half a million tons a year. Under the pressure of scant orders in the domestic market, somewhat better things were expected of the American iron trade.

The full statement of exports in those lines of which the weight is returned is presented in the following table:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	April		10 mos. end'g April.	
	1903.	1904.	1903.	1904.
Pig iron	1,143	2,898	15,793	29,945
Scrap	271	1,444	5,050	12,454
Bar iron	3,561	3,391	13,517	17,410
Wire rods	5,612	37	27,790	12,332
Steel bars (not wire rods)	885	4,145	11,615	15,311
Iron rails	7	208	61	1,525
Steel rails	1,575	10,460	21,759	68,197
Billets, ingots and blooms	54	28,376	2,040	113,366
Hoop, band and scroll iron	386	309	1,415	2,419
Iron sheets and plates	354	517	2,363	4,499
Steel sheets and plates	1,670	3,257	11,349	14,285
Tin plates, terne plates and taggers' tin	4	1,362	685	2,093
Structural material	2,234	3,854	26,978	25,656
Wire	11,104	11,549	81,318	92,922
Cut nails	685	798	5,725	7,845
Wire nails	2,876	2,765	22,883	27,444
Other nails, including tacks	205	244	2,011	2,045
Total	32,594	75,414	251,142	449,648

Much the greater swing in the foreign trade has been in the matter of imports. If the export trade has not increased wonderfully, imports have at least been shut off. In ten months ending April imports of pig iron and crude steel were 975,000 tons less than in the ten months ending a year previous, a swing of over a million tons annually in these two lines alone. The following table shows the monthly movement:

IMPORTS OF PIG IRON AND CRUDE STEEL—GROSS TONS.

	Pig Iron.		Steel.	
	1902-3	1903-4	1902-3	1903-4
July	62,166	38,046	37,167	33,083
August	79,447	40,475	39,027	20,380
September	82,196	16,414	27,726	13,530
October	67,204	18,704	32,036	10,343
November	100,400	18,765	41,077	6,580
December	118,373	14,719	26,230	1,425
January	110,679	10,812	38,691	1,860
February	45,187	3,841	20,151	1,514
March	59,628	12,400	31,464	1,146
April	99,944	7,713	29,014	879
Total	825,214	181,889	322,583	90,738

In the following table is given the full line of articles on which the government returns include tonnages, and it will be noticed that if structural shapes are neglected, since they figure only since July 1, 1903, having previously been returned by value only, there has been a drop of over a million tons in ten months in our imports, or at the rate of nearly a million and a quarter tons a year. This portion of the statistical showing is clearly gratifying.

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	April		10 mos. ending April.	
	1903.	1904.	1903.	1904.
Pig iron	99,944	7,713	819,185	181,889
Scrap	9,798	1,291	107,242	24,966
Bar iron	2,336	1,289	36,781	16,741
Iron and steel rails	11,378	3,903	104,267	37,632
Hoop, band or scroll	114	204	1,395	1,799
Steel ingots, slabs, billets or bars	29,014	879	321,584	90,757
Sheets and plates	411	361	6,239	9,825
Tin and terne plates	6,363	5,917	42,754	43,114
Wire rods	1,877	1,519	19,353	15,754
Wire and wire articles	496	310	2,985	4,325
Structural shapes*		532		13,229
Total	161,231	23,918	1,429,682	425,964

*Not reported separately prior to July 1, 1903.

THE SHRUNKEN BUYING POWER OF RAILROADS.

Suppose that a judge from a distant planet were summoned and a case presented to him in the following terms:

"The railroads of the United States, in the last year for which statistics are available, have succeeded in paying the highest average dividend rate for over two decades, while owing to the increased security of investment their interest rate on bonded indebtedness has fallen to the lowest average in their history. With wonderful economies in the handling of freight and a steady increase in the length of haul the rates charged per ton per mile have in 20 years decreased only 38

percent while passenger rates have decreased still less. A few years ago a new style of freight car, made of steel instead of wood, has been brought forth which offers very important economies, but to date less than 8 percent of the freight cars in existence are of this type. In the past few years there have been loud complaints by shippers of a lack of facilities on the part of the railroads to handle the business offered them. What, then, in your judgment would be the present outlook for the railroads making improvements?"

Is it straining a point to say that the reply of this judge would be:

"Your railroads are obviously in a most prosperous condition. Their net profits must necessarily have shown an enormous increase, and with more business offered them than they can conveniently handle, and with opportunities for decreasing their operating expenses, they will undoubtedly be able to devote a much larger share than ever of their receipts to making improvements."

When told that the outlook was exactly the reverse, that for nearly a year railroad orders had been on a greatly decreased scale, and that in the past few weeks railroads had been busy canceling many of the meager orders they had given, our judge from a distant planet would unquestionably be greatly surprised, and would want an explanation, as do many who are nearer home.

The overcapitalization of railroads has acted as a two-edged sword. It calls for large payments from earnings in the form of interest and dividends, and at the same time discourages the raising of capital for improvements by further obligations. The ratio of expenses to earnings has averaged between 67 and 70 percent in the past half dozen years, which would be an extremely low percentage for any manufacturing enterprise whose visible assets wore out as rapidly as those of the railroads. Cars, locomotives and track require frequent replacement, and if they constituted the principal part of the capitalization there could be a much higher percentage of expenses to gross earnings and yet a larger return upon capitalization. Last year the average rate on bonds was only 4.09 percent and on stocks only 2.93 percent, yet the bond interest represented 13 percent of the gross revenue and the dividends 9 percent. The railroads do not turn their capital often enough.

There can be no question that the average operation of the railroads of the country is not economical. Rates per ton per mile are much higher than has been shown to be necessary to yield large profits. The last statistics showed the average freight earnings for the country to be 7.6 mills per ton mile, with an average haul of 131 miles. Under other than the most favorable conditions iron ore has been hauled at a cost of from 1.9 to 2.4 mills per ton mile, and while it costs more to handle some commodities than others, those which preponderate in tonnage are the most easily hauled. Iron ore is not always hauled at low rates; while the average freight charges for the whole country last year were 7.6 mills per ton mile, the roads which showed the greatest density of iron ore traffic actually charged more than this average, the Duluth & Iron Range Railroad showing 10.4 mills per ton mile and the Duluth, Missabi & Northern Railway 9.4 mills, on hauls of about a hundred miles. The statement of James J. Hill before a Congressional committee will be recalled, to the effect that he could build a railroad on scientific lines to carry freight only, which would put out of business any water way having a depth of less than 20 feet, which means figuring in fractions of a mill rather than in whole mills.

To what extent the profits of the railroads, as would be indicated by the published tariff rates, are depleted by the terminal railroad system cannot be computed. Now and then a case comes to light where a short terminal road received the lion's share of the total rate. In all cases there is an allowance which is neither good for the railroad nor for the small shipper who cannot maintain a terminal railroad, although it must be confessed that the terminal railroad industry has so flourished that it is really a small shipper who cannot operate a half mile of track and secure what is substantially a rebate.

At any rate, the conclusion of the whole matter is that after several years of unexampled prosperity the railroads are very poor and simply cannot afford to do that which they ought to do. Their buying usually constitutes the foundation of prosperity in the iron trade, yet in the past few months there has been a substantial degree of activity, scarcely aided at all by the railroads. Never before have the various smaller customers of the iron trade been so conspicuous, and for any activity the iron trade may expect in the near future it will evidently have to look to them.

British and American Mechanical Engineers at Chicago.

(Special Telegram.)

CHICAGO, June 1.—The first session of the joint meeting of the American Society of Mechanical Engineers and of the Institution of Mechanical Engineers of Great Britain was held Tuesday evening in the Fine Arts building, and was attended by about 250 members, ladies and guests. The evening was taken up with addresses of welcome by the Hon. Lawrence E. McGann, comptroller of the city of Chicago, representing Mayor Harrison, and by Ambrose Swasey, president of the A. S. M. E., and by the response of J. Hartley Wicksteed, president of the British Institution. Capt. Robert W. Hunt, chairman of the resident committee of the American Society of Mechanical Engineers, introduced Mr. McGann. After the meeting adjourned a reception was held in the parlors of the Auditorium hotel, the headquarters of the convention.

Mr. McGann's speech, aside from his remarks of welcome, was devoted to a comprehensive summary of the difficulties which Chicago municipal engineers had been forced to overcome in the building up of their city; the limitations in the matter of finance for the construction of the various enterprises; the swampy and low nature of the land; the rapid growth in population, frequently necessitating the rebuilding of works that were supposed to have been planned for the limit in the number of residents. He briefly reviewed what had been accomplished in the 70 years of the city's history.

In his response to Mr. McGann, Mr. Ambrose Swasey said in part: "The American Society of Mechanical Engineers has on two occasions been the recipient of the generous hospitality of this city. First, when but a youth of six; again, when at the age of thirteen; and now at the sturdy, yes, even strenuous, time of life, having almost neared the quarter of a century mark, we are as happy again to assemble in your midst. This is the only city where the society has ever held three of its mid-year meetings, and surely this expresses much more forcibly than anything I can say how much we appreciate coming where we have always been so cordially received. Out local committee has prepared a splendid program, and I only hope that our strength may hold out until the end of the week. But we will be delighted to go with our guests to see the collection of fine arts, the beautiful and extended parks and boulevards, the manufacturing and commercial institutions of this great city of our inland sea and of our Western prairies. And now, Mr. President, it is an added and an exceptional pleasure to welcome you and the Institution of Mechanical Engineers to this country, to this city, and to this convention. We feel that we may take a just pride in building this joint convention with your institution, an institution with such an honorable record, with such a great history; and when we remember the distinguished men who have been enrolled on the membership of your institution—such men as Stevenson, Siemens, Whitworth, Armstrong, and I might mention scores of others down to the present time, truly we may feel, as I said, a pride in joining in this convention with you.

"As one of the members who enjoyed the warm welcome and the unbounded hospitality extended to the American engineers during their visits to your country in 1899 and 1900, I am glad we can have the privilege of reciprocating to some extent your kindness and attention. I only hope that you

may feel as much at home as you made us to feel at home with you when sojourning with you in your country. I thank you, Mr. President, and the members of the Institution of Mechanical Engineers for coming here, for it not only brings us closer together as engineers, but closer together as citizens of the two great English-speaking nations."

Mr. Wicksteed, following Mr. Swasey, said: "Mr. Comptroller, I join with Mr. Swasey in thanking you for the extremely kind and interesting way in which you have welcomed us to this wonderful city. I assure Mr. Swasey that we do feel very much at home already. It is indeed a great privilege to come here and to feel like cousins, even more intimately related to all the inhabitants of this country. We feel at least that you are all our American cousins. It is also, of course, a very great delight to come to a country which speaks the English langauge. And it is a constant source of congratulation to me that this great nationality that has been created on this continent has adopted the English language; has preferred it to any other language. As Sullivan says, 'In spite of all temptations to belong to other nations' they seem to remain English. It is through the kindness of the American Society of Mechanical Engineers that we, the English Institution, are able to partake of your hospitality in this city. We feel greatly indebted to you for extending this hospitality.

"More than 300 desired to come and sent in their names, but as many of them are men too much immersed in business to leave their work for two omnths, you can hardly expect as many to come from England for two months as you have coming from different parts of this country for two weeks. However, all those that have come I am sure feel that it was the best resolve they ever made in their lives to leave their business behind them and to come over to this exhilarating country. The country, of course, is inexhaustible. We can go back with an appetite for more. We came to New York and saw a business city—a solid business city—unsurpassed, and we saw buildings and streets which excited our admiration. We went to Philadelphia, and we saw something totally different, more like England, more like a manufacturing town, and we saw there the largest and finest park that I have ever seen. We went to Washington, and we saw the most beautiful equestrian statues, a city of the most magnificent distances, of buildings of classical style, something totally different from the other two. And then we came to Chicago, which seems to me to be the place of all others to which an engineer should come. Now Chicago is only the age of any of us. It comes within the allotted span of life. In 70 years Chicago has sprung up from nothing. No doubt a great deal of the prosperity and increase of Chicago must arise from natural causes, from force of circumstances, from its position on this vast inland sea; but without the engneer it would not have been possible to make Chicago fourteen feet higher than the lake, as Mr. McGann says has been done. The maximum of progress is to be found in perfection I think in this city. I have seen today what all men in our party ought to make a point of seeing, and that is a system of underground tunnels, in which are conveyed cables of telephone wires, but also in which are going to be conveyed cars for the transport of goods throughout the city. Coal can be transported and ashes can be taken away. Goods can be transported from one part of the city to another. There is already 20 miles of this tunnel system. It is the pluckiest thing I have ever seen, and it is really a most wonderful idea, one which I do not think was conceived of as a whole by the first promoters. But it is going to turn out one of the cleverest things, I think, that has ever been introduced in a city. Besides this we saw, and I think it was in connection with the same enterprise, an automatic exchange for telephone messages, so that if you put your instrument to the right notch you can connect yourself direct with any of the addresses which your telephone will reach without the aid of an operator at the exchange to switch you onto the wire you want to get. It mechanically informs you whether the wire is busy, and I believe it informs you when it is free.

"Well, ladies and gentlemen, the impression that must be made on our minds, when we see this wonderful city that has sprung up in 70 years is that the mechanical expert must have played a secondary part in this city; that these must have been all the way through men and women with big hearts, big brains and great pluck. And when I listened in rapt attention to Mr. McGann's description of the limitations that have been imposed on the builders of this city, it is the more marvelous that so much has been accomplished. The well known independence of the American character, I suppose, will rise superior to these restrictions, and by individual energy, enterprise and pluck I suppose they will somehow do what we think can only be done by the combined action of a community and corporation.

"Ladies and gentlemen, on your behalf, I thank Mr. McGann for the welcome he has given us to this city, and I thank the American Society of Mechanical Engineers for having invited us to come over."

The total attendance this morning is about 700. Much pleasure was given by the announcement from the council that Mr. John E. Sweet had been elected to honorary membership in the American Society of Mechanical Engineers. A cordial tribute of esteem was paid Mr. Sweet by President Swasey. Secretary Hutton gave a resume of the progress made in the movement for a union engineering building and gave the status of the project.

The papers of the morning were by Harrington Emerson on "The Wages Problem;" by George Watson on "Some Recent Examples of Destructors for Town Refuse;" and by C. Newton Russell on "Refuse Destruction by Burning, and the Utilization of Heat Generated."

Following are the names of members of the British party:

President—J. Hartley Wicksteed (with Mrs. Wicksteed), Leeds.
Member of Council—J. W. Spencer (with son), Newcastle-on-Tyne.
Daniel Adamson, Hyde.
Rear-Admiral Ahmed Pasha, Constantinople.
Jabez Attwood, Stourbridge.
Emerson Bainbridge, London.
James Barningham (with Mrs. Barningham and two daughters), Manchester.
John Barr, Kilmarnock.
William Blane (with Mrs. Blane), Johannesburg, S. Africa.
Basil Bliss, London.
W. Stanley Bott, Newark-on-Trent.
William Carter, Chester.
George Chaffey, Los Angeles, Cal., U. S. A.
E. J. Chambers (with Mrs. Chambers), Wolverhampton.
John Cochrane (with Mrs. Cochrane), Glasgow.
E. G. Coker, D.Sc., Montreal.
Frederick L. Croft, Bradford.
L. W. Crosta, Nottingham.
William Daniel (with Mrs. Daniel), Leeds.
J. W. Darling (with Mrs. Darling), Keighley.
James Donaldson, London.
James Dronsfield, Oldham.
William Dryden, Preston.
George R. Dunell, London.
Hugh S. Dunn, Kilmarnock.
N. B. Ellington, Switzerland.
John Etherington, London.
E. A. Forward, Orpington, Kent.
A. J. Gimson, Leicester.
Arthur H. Gledhill (with Mrs. Gledhill), Halifax.
Louis Greaven, Mexico.
E. M. Griffiths, London.
T. Bernard Hall, Birmingham.
H. W. Hanbury, Glasgow.
H. Lionel Harris, London.
W. R. A. Harris, Wooburn.
John R. Hewitt, Bushey, Herts.
A. Franklin Higgs, Gloucester.
Enoch Hind, Nottingham.
J. W. Howard (with Mrs. Howard), Gloucester.
William Ingham, Manchester.
Hugh Inglis (with Mrs. Inglis), Pinner.
Thomas Irons (with two ladies), New South Wales.
Edgar J. Jenkins, Rotherham.
Herbert Jewson, Dereham.
Walter Jones (with daughter), Stourbridge.
Archibald Kenrick, Jr., Leeds.
William G. Kirkaldy, London.
J. W. Knowles, Bradford.
F. M. T. Lange, London.
J. E. Leigh, Manchester.
Prof. D. A. Low, London.
John Macdonald, Glasgow.
S. H. March, Manchester.
C. R. Edward Marks, Birmingham.
G. Croydon Marks, London.
Lewis Marshall, Halifax.
Percival Marshall, London.
Rudolphe Mathot, Brussels.
J. A. McLaren, Leeds.
George Mitchell, London.
William G. Mitchell, London.
W. E. Morris, London.
Sam Naylor, Halifax.
Thomas G. Newton, London.
Arthur Peckett, Ware.
W. E. Plummer, Bradford.
A. Rateau, Paris.
Anton Röper, Düsseldorf.
George A. Ryder, Bolton.
Alfred Saxon, Manchester.
W. H. Scholes, Buenos Aires.
J. H. Shepherd, Swindon.
F. H. Simpkin, Sheffield.
Lieut. M. Sirri, Constantinople.
Montague H. Smith, London.
Sidney Smith (with Mrs. Smith), Johannesburg, S. Africa.
W. T. Smith, London.
William Tartt, South Godstone.
W. J. Tennant, London.
Frank Thom, Blackburn.
J. C. Ward, London.
F. A. Warlow, Sheffield.
Prof. W. H. Watkins, Glasgow.
L. F. Whitmore, Erith, S. O., Kent.
Charles Wicksteed (with Mrs. Wicksteed), Kettering.
John H. Widdowson (with Mrs. Widdowson), Manchester.
Edgar Worthington, London.

The Labor Situation.

ST. LOUIS MACHINISTS' DEMAND REFUSED.

On April 20, Eugene Sarber, business agent of District 9, International Association of Machinists, St. Louis, mailed to President Fred Schwedtmann, of the St. Louis Metal Trades Association, the following set of shop rules to govern the shops of members of the association from May 20, 1904, to May 20, 1905:

SHOP RULES TO GOVERN

The.....in their relations with the machinists and machinsts' apprentices in their shop. To govern from May 20, 1904, to May 20, 195.

1. Nine hours shall constitute a day's work. These hours shall be worked between 7 a. m. and 5 p. m. and a schedule thereof posted in the shops. All work outside of such schedule is to paid for as overtime. Night gangs shall work 54 hours per week, on the regular night schedule posted in the shops, and any time worked outside of schedule hours shall be paid for as overtime.

2. All overtime up to 12 o'clock midnight shall be paid for at the rate of time and one-half time, and that after 12 o'clock and the following holidays, New Year's Day, Fourth of July, Labor Day, Memorial Day, Thanksgiving Day, Christmas Day, Washington's Birthday and Sundays shall be paid for at the rate of not less than double time. In cases of emergencies, where shop machinery breaks or runs down, and it is absolutely necessary to repair the same, so that the factory can run the following day or on Monday, this work shall be paid for at the rate of time and one-half time. The repairs above referred to apply only to the machinery of the employer. The foregoing rates not to interfere in any way with existing conditions, that is where a higher rate than the above is paid now, no change will take place. Such rates for overtime will not apply to men regularly employed on night schedule.

3. Apprentices shall be formally indentured under the official contract mutually adopted for a period of four years to learn the machinists's trade, and at the time of making said indenture shall be between the ages of 16 and 21 years. There may be one apprentice for the shop, and in addition not more than one apprentice for every five machinists. No apprentice shall, except for just cause, leave the service of his employer until he has served his full term, when he shall receive an apprentice's certificate, and if competent receive machinists' wages. Apprentices shall not work overtime.

4. We reserve the right to refuse to work with non-union men.

5. We, the employer, will receive committee of our machinists to discuss grievances and in case of misunderstanding we will meet a committee selected by our machinists and endeavor to adjust the matter on a fair and equitable basis and will not discriminate against any machinists on such committee.

6. The minimum rate of wages for machinists shall be 30 cents per hour. For machine operator and specialist machinist, 22½ cents per hour.

7. None other than machinists or machinists' apprentices shall do machinists' work.

8. Either party to this agreement desiring to amend or cancel it, shall give 30 days' notice in writing to the other party.

The letter of transmittal simply said: "Enclosed find shop rules to govern the employment of machinists and apprentices to take effect May 20, 1904. If the shop rules contain any clauses which are not clear to your association we are only too willing to meet you in conference and give a more lucid interpretation of same."

The employers evidently found no difficulty in interpreting the document. On May 10 the St. Louis Metal Trades Association, whose president then was E. E. Koken, replied, saying: "We regret that your demand for a closed shop and other changes are so radically opposed to the fundamental principles of our association that we cannot entertain them. Notwithstanding the unfavorable change in business conditions when compared with last year, we shall make no change in hours or wages at the present time. We enclose a copy of the shop rules which will govern our shops after May 20, 1904."

The shop rules referred to in the above are as follows:

ARTICLE I—Fifty-four hours shall constitute a week's work. These hours shall be worked between 7 a. m and 6 p. m., and a schedule thereof be posted in the shops. All work outside of such schedule will be paid for as overtime. Night gangs shall also work 54 hours per week on the regular night schedule posted in the shops, and any overtime worked outside of the schedule hours will be paid for as overtime.

ARTICLE II—All overtime up to 12 o'clock midnight will be paid for at the rate of time and one-half time, and that after after 12 o'clock, and the following holidays: New Year's Day, Fourth of July, Memorial Day, Labor Day, Thanksgiving Day, Christmas Day and Sundays will be paid for at the rate of not less than double time. In cases of emergencies, where shop machinery breaks or runs down, and it is absolutely necessary to repair the same so that the factory can run on the following day, or on Monday, this work will be paid for at the rate of time and one-half time. The repairs above referred to apply only to the machinery of the employer.

ARTICLE III—No apprentice shall, except for just cause, leave the service of his employer until he has served his full term of four years, when he shall receive an apprentice's certificate and if competent receive journeyman's wages.

ARTICLE IV—There shall be no arbitrary limitation of the amount of work a workman or machine may turn out in a day. We will countenance no condition which is not fair and which does not insure a good wage to a good workman.

ARTICLE V—We will not interfere with the proper functions of labor organizations and will permit no interference with the proper management of our business.

ARTICLE VI—There shall be no discrimination in employment on account of membership or non-membership in any labor organization, and there shall be no discrimination against, or interference with, any workman by his fellow employes, because of his or their membership or non-membership in any labor organization.

ARTICLE VII—The employers are responsible for the work turned out by their workmen and shall, therefore, have full discretion to designate the men they consider competent to perform the work, and to determine the conditions under which it shall be prosecuted.

ARTICLE VIII—No general reduction will be made in the wages paid at present until further notice.

ARTICLE IX—Any workman may leave our employment whenever he sees fit, and it is the privilege of the employer to discharge any workman whenever he sees fit. But this rule shall in no case permit collective action contrary to the provision of Article X.

ARTICLE X—We will receive our employes individually or by committee to discuss grievances or other matters and will not discriminate against any employe on that account. In case of a misunderstanding we will meet a committee of our employes and endeavor to adjust the matter on a fair and equitable basis, and in case of inability to reach a satisfactory conclusion we will, without unreasonable delay, submit the question to a conciliation board of six persons, three chosen by the employer and three by the employes, who shall attempt to adjust the matter. And in case of inability to reach a satisfactory conclusion, the board may agree upon a final board of conciliation or arbitration, whose decision shall be final and binding on both employer and employe. Disapproving absolutely of strikes and lock-outs, there shall be no cessation of work pending conciliation or arbitration, and we will not arbitrate any question with men on strike. Nor will we countenance a lock-out on the part of any employer who has locked out his employes without complying with this rule.

ARTICLE XI—None but employes shall be admiitted to this shop except by permission obtained at the office.

The business agent replied to the above in a letter to the press, a copy of which was sent to the St. Louis Metal Trades Association. He claimed that the proposed shop rules were a violation of the existing agreement between the association and the union, and addded that "no self-respecting body of men could ever consent to work under them." In reply the St. Louis Metal Trades Association said that it was willing at any time to confer on questions concerning employment in its shops, and that its members would confer with their employes or with a committee of the machinists' union, but subject to the principles of the association as outlined in the rules above quoted. The latter adds that the principles for which the association contends are the following:

"1. No discrimination in employment between union and non-union men. 2. No arbitrary limitation in production of men or machines. 3. No arbitrary limitation of the right of any one to learn a trade. 4. The right of the employer to determine the workmen or machines he considers best adapted to do the work. 5. Workmen shall be paid wages in proportion to their ability and energy. 6. Sympathetic strikes shall not be countenanced. We believe that conference and arbitration are the proper methods of settling disputes between employers and employes."

(Special Telegram.)

ST. LOUIS, June 1.—The shop rules recently adopted by the St. Louis Metal Trades Association have now been in effect for 10 days and all shops of members are working under these rules.The patternmakers in two shops went on strike but with these exceptions conditions are quiet. The notice to the men, enclosed in pay envelopes on May 20, stated that

any one unwilling to comply with the new regulations should give up employment.

CHANGES IN AMALGAMATED ASSOCIATION BY-LAWS.

At the late Cleveland convention of the Amalgamated Association of Iron, Steel and Tin Workers, important changes were made in the constitution and by-laws. One of the most important clauses adopted prevents any board or official of the organization from permitting deviations during the scale year from the scale as signed. Heretofore the advisory board had power to permit changes in the scale during the scale year and exercised this power early this year in permitting the reduction of 20 percent in the tin plate and sheet wage scale. The new law bearing on this point reads:

"After the scale has been signed by the manufacturers and the A. A., under no consideration shall any board of officials or any official of the A. A. be allowed to grant the manufacturers any deviations from scale as signed for the scale year."

Another law prevents the president of the association from leaving the city without first notifying the secretary of his whereabouts and he is to keep the latter posted as to where he can be found at all times. This clause is in part as follows: "He shall preside at all national and special conventions, preside over all national and special conferences, preside over and enforce the laws, thereof. He shall have the casting vote when equally divided on any question, but shall not vote at other times except at the election of officers. He shall appoint officers protem; he shall, when called away to attend to any duties pertaining to the affairs of the association, notify the secretary-treasurer of its object, his destination and where he could be reached by telegram or other communication from the national office, a record of which shall be kept, and in case the national president is absent from his office and his whereabouts not known for one week to the national office force, they shall at once notify the first vice president to take possession of the office and provide for an election according to our laws."

NATIONAL METAL TRADES ASSOCIATION.

The administrative council of the National Metal Trades Association, in session at Cincinnati, May 30 and 31, had under discussion a number of important subjects. The meetings were held in the office of Commissioner Du Brul. The principal matter taken up was the strike situation at Chicago. The national association decided to begin to throw men into Chicago as soon as the Chicago district committee gives the word. The energies of the association will largely be confined to securing men and the association will put out employing agents to send men to that city. The Chicago Employers' Association will look after the enforcing of the law and prosecution for assaults, and the Chicago Metal Trades Association will look to the special police, guards for the plants and injunctions. It was decided that if found necessary, Commissioner Du Brul or Secretary Wuest would establish an office temporarily in Chicago to conduct the employers' side of the strike. The employers are forcing the situation in Chicago, and the local association at that point has voted $100,000 for its own purposes. The employers take the position that the men must do struck work or quit. It is estimated that about 9,000 men will be affected and about 100 shops. The strike is expected to be on in full force on Wednesday, June 1.

The condition of affairs at Youngstown, O., was taken up. The employers at that place wanted to reduce certain men without reducing others, which resulted in a reduction of about 3 percent in wages, but the machinists demanded that all men be reduced, which would make a reduction of about 4 percent in the total wages. The council resolved that this was shop management, and that if the employes interfered with the right of the employers to make satisfactory arrangements with their men, the employers be protected in such rights.

Support was voted to the Rumelli Dawley Co. of St. Louis in its boilermakers' strike. The demand of the unions in this strike is that two boilermakers be employed at all air hammers instead of a boilermaker and helper as heretofore, and that it shall be a closed shop.

A committee was appointed to take up the plan and scope of the association and secure co-operation of other associations whereby much duplication of work can be eliminated. This committee consists of W. D. Sayle, F. K. Copeland, A. Falkenau, C. E. Hildreth, and O. B. Kinnard. It was recommended that this committee call for a meeting with other associations to see what arrangements could be made. The matter of the relation of local to national associations was also referred to this committee to investigate the cost of conducting local and national associations, and see if by combination the total expenses can be reduced and also arrange for a basis for combination. This proposition may require considerable change in the constitution and by-laws of the association in order to make more certain and definite the functions of each association.

Article No. 9 of the by-laws which was passed by the convention at Philadelphia and referred to the administrative council for legal advice was declared effective from and after May 31. The idea of the article is to make the procedure in handling strikes more definite. It is given herewith in full:

Sec. 1. Whenever a disagreement shall arise between a member and his employes, such as seems liable to lead to collective action on their part, immediate written notice thereof shall be given to the commissioner and the chairman of the district. These officers shall be kept fully advised until such difficulty is finally adjusted.

Sec. 2. Whenever a collective demand is made by employes on a member of this association, notice of such demand in writing shall be immediately sent to the commissioner and district chairman, and a full account or copy of such demands shall be mailed to such officers. Note.—Whenever possible, it shall be insisted that such demands shall be put in writing and a statement made to those presenting the demands that a copy will be forwarded to the N. M. T. A.

Sec. 3. Attendance of Commissioner. If in the judgment of the chairman or the commissioner a representative of the association is required on the grounds, the commissioner shall at once proceed to the scene of the difficulty or deputize in writing some responsible person to act for him.

Sec. 4. Authorization of Strike Defense. The defense of a strike shall not involve this association, unless regularly authorized in writing by the commissioner and approved by the administrative council. Should the commissioner and the member disagree as to the measure or method of relief, the member may appeal to the administrative council and its decision shall be final.

Sec. 5. Methods of Relief. Any of the following methods may be adopted by the commissioner for the relief and protection of members:

(*a*) Assistance in procuring men to replace strikers (in which case the number of men so procured by this association shall in no instance exceed 70 percent of the number of the particular trade or trades on strike which were employed previous to the difficulty, as shown by the last quarterly reports). If, in order to procure men in the event of a strike, it shall be necessary to pay a bonus to secure their services, such bonus may be paid at such rate and to continue only during such time as the administrative council may decide.

(*b*) Legal Measures. The employment of legal measures to be invoked only on the written authorization of the commissioner.

(*c*) Having members' work done.

(*d*) Financial Assistance. In cases where the administrative council may determine that financial assistance be necessary in addition to relief measures, *a*, *b* or *c*, such assistance may be rendered in such amounts and at such times as the administrative council may decide.

Sec. 6. Conduct of Strike. The conduct of the strike shall be vested in the district committee acting under the direction of the commissioner in order to be binding upon the association.

Sec. 7. Directions entailing an expense must be given or confirmed in writing by the commissioner. Such directions shall be given in advance of the action, and a limit be set to each expense so authorized. Any expense bill which has not been so authorized before it is incurred, shall not be approved by the commissioner, but shall be referred to the administrative council for final action.

Sec. 8. Authorized relief expenses shall be paid and charged to the reserve fund.

It is expected to relieve Commissioner Du Brul by July 1 and a committee has been appointed to select a new commissioner. The proposition to employ an assistant to the commissioner was not deemed advisable in view of the expense involved. The resolutions adopted in accepting Mr. Du Brul's resignation are as follows:

"In accepting the resignation of E. F. Du Brul as commissioner of the National Metal Trades Association, we the administrative council of that body desire to place on record our deep appreciation of the valuable services rendered by him, recognizing the fact that it is principally through the unselfish efforts of Mr. Du Brul that the association occupies the high place it does today. Therefore, be it

"Resolved, That we do hereby accept the resignation of Mr. Du Brul with sincere regret, and further

"Resolved, That we wish most earnestly for him every success in his future undertakings."

Those present were. H. N. Covell, of New York, president; J. W. Gardner, Quincy, Ill., first vice president; W. D. Sayle, Cleveland, second vice president; Fred A. Geier, Cincinnati, treasurer; O. B. Kinnard, Minneapolis; A. Falkenau, Philadelphia; C. E. Hildreth, Worcester, Mass.; Geo F. Steedman, St. Louis, Mo.; M. H. Barker, Boston, Mass.; P. B. Kendig, Seneca Falls, N. Y.; F. K. Copeland, Chicago; E. F. Du Brul, commissioner; Robert Wuest, secretary. The visitors to the council meeting were entertained at luncheon at the Business Men's Club, and in the evening Commissioner Du Brul acted as host at a dinner at the Queen City Club.

The committee appointed to select a success to Mr. Du Brul has a man in view, but his name has not been made public. The council has requested that Mr. Wuest remain with the association, and he has consented to do so if the person now in mind accepts the commissionership.

Copies of the certificates of recommendation issued by the association to good workmen of fair character who have proved their loyalty to their employers by faithful service during a labor difficulty, will be mailed to the members of the association, who will be requested to place one in the pay envelope of every employe, and explain the object of it.

CHICAGO MACHINISTS' STRIKE SPREADS.

CHICAGO, May 31.—The machinists' situation now has every appearance of developing into what will be a test of the relative strength of the Chicago Metal Trades Association, and the district lodge of the International Association of Machinists. The labor organization refuses to have further dealings with the Metal Trades Association, and is now seeking to make individual contracts with the employers on the basis of 32 cents an hour for machinists and 37 cents an hour for tool and die makers, and not 33 1-3 cents and 37½ cents, respectively, their original demands, as reported last week. So far, it has had little success in this direction, and judged from its procedure to date, the union is apparently settling down for a long drawn out struggle, which may yet involve several other branches of the metal working trades.

A new phase was given to the situation by the adoption of a resolution by the Chicago Metal Trades Association at its meeting last Thursday evening, that, beginning Tuesday, May 31, the working hours in the shops of each memeber would be changed from nine hours per day to nine hours and fifty minutes for five days, and a half day on Saturday, consisting of four hours and fifty minutes. The enforcement of this rule, while not changing the number of hours per week, which remain 54, is expected to precipitate a general strike in the shops of all the members of the association, for which purpose it was intended, as union officials declare their organization is as strong in its determination to fight for the maintenance of the nine-hour day as for the principle that there must be no change in the classification.

The machinists employed in the shops of the Goodman Mfg. Co., Kroeschell Brothers Ice Machine Co., Fischer Machine Works, Wilson Paper Box Co. and E. H. Wachs & Co. joined the ranks of the strikers when the above notice was posted, and there are now 1,800 men on strike, the other shops at present affected being those of the Goss Printing Press Co., C. F. Elmes Engineering Works, Foster-Kimball Machine Co., John Davis Co., Link-Belt Machinery Co., Sullivan Machinery Co., Barnhart Bros. & Spindler, Illinois Machine & Foundry Co., Olson & Tilgner Mfg. Co., W. R. Perrin & Co., Latham Machinery Co., and Greenlee Bros. & Co. In almost every instance, the metal workers employed in the various shops, have quit in sympathy with the machinists; and while the brass workers and blacksmiths are under contract, the shutting down of so many machine shops will have the effect later of throwing several hundred men engaged in these trades out of employment. The Chicago Metal Trades Association is raising a large fund by assessment on its members—said to be $100,000—for the purpose of hiring men to fill the strikers' places, and is in a strong position to cope with the present situation. The National Metal Trades Associations will also aid its local members.

In addition to now demanding the ten-hour day, the employers are insisting upon the old scale of wages, i.e.: 30 cents an hour for machinists and 35 cents an hour for tool and die makers; for a change in the classification, providing that roughing out work shall be done by men not classed as machinists for which a lower rate of pay shall be paid; for the right to put one man on two machines where the nature of the work permits, and for a broader interpretation of the rule regarding apprentices.

ffl (Special Telegram.)

CHICAGO, June 1.—The machinists employed in six additional shops refused to work the ten-hour day yesterday, as called for by the notice which the members of the Chicago Metal Trades Association had posted in their respective plants, notifying the men of the adoption of the ten-hour day, and struck. These firms are the Chicago Writing Machine Co., Cook & Chick Co., Weir & Craig Mfg. Co., James & Foote, Union Specialty Machine Co. and the Scovill Mfg. Co. President Hibbard, of the local association of employers, is quoted as saying that the first attempt to fill the places of the strikers will be made tomorrow at the plant of the Goss Printing Press Co. Enough men, it is said, can be secured to take the places of all the strikers, but the problem is to prevent violence and intimidation. Efforts of the association will be concentrated on only one shop at a time and as soon as that is running successfully another will be taken up. Mr. Hibbard said that the association is ready to re-open negotiations with the union at any time and will continue to ask precisely what it has for a year urged. The ten-hour day inaugurated yesterday so far as the machinists are concerned will not be insisted upon. The manufacturers adopted it only for the purpose of precipating the strike.

DEFEAT OF UNION BRASS WORKERS AT CHICAGO.

The Brass Manufacturers' Association of Chicago has won a complete victory over the International Brass Workers' Association, the latter having called out its members in a Chicago district on January 1 in an endeavor to establish the closed shop principle. The brass workers this week submitted modified terms of settlement which were refused by the manufacturers, practically all of the places of the strikers being filled and the plants running in full. The strikers demanded a reinstatement of all of the men who walked out, but this was refused by the manufafcturers. It has been decided by the Brass Manufacturers' Association to enter into no further agreement with the union, and the strikers seeking re-employment must do so in the capacity of individuals.

The pipe mill of the Eastern Tube Co., Zanesville, O., which has been idle for nearly a year, resumed operations this week. About a year ago the company went into the hands of a receiver and the plant was recently sold to the Mark Mfg. Co., of Chicago, who are now operating the same. Corbett & Starr, Park building, Pittsburg, are the Eastern agents.

The Greer tin plate mill of the American Sheet & Tin Plate Co., New Castle, Pa., is idle this week but will resume operations on Monday, June 6. The plant has been shut down temporarily in order to give the tin house workers an opportunity to catch up on the large accumulation of black plates.

The Upson Nut Co., Cleveland, which has maintained its general offices at its works for many years, has just taken quarters at 607 Garfield building.

FOUNDRY FANS AND BLOWERS.

At the regular monthly meeting of the Pittsburg Foundrymen's Association held at Pittsburg on Tuesday, May 31, the committee on fans and blowers appointed several months ago made a partial report. It was compiled at the request of the committee by Herbert E. Field, metallurgical engineer of Mackintosh, Hemphill & Co., from replies to a circular letter containing a list of questions as shown in the report. A paper read before the association by Thomas D. West resulted in the appointment of this committee and started the investigation into the relative merits of the fan and the blower. Tests are shortly to be made at the plant of Mackintosh, Hemphill & Co. by a number of experts in cupola practice, with a view to gaging more closely the merits of fans and blowers for foundry use, and the results of these tests will be given to the members of the Pittsburg Foundrymen's Association at the September meeting. The report as compiled by Mr. Field follows:

At the request of the committee on fans and blowers of the Pittsburg Foundrymen's Association, I have examined and classified the various replies to the questions which they sent out to foundrymen. From this classification, I have taken the following data, which may be of interest to the association. At the outset, I would say that it would be impossible to include all these items in this report. The lack of certain important details in most of the replies makes an accurate comparison impossible. Some of the replies, however, were very complete and indicated that a great deal of attention was paid to this department of the foundry work. They involved a considerable outlay of time, and on the whole I consider that the Association is to be congratulated in obtaining replies from so many representative foundrymen.

In submitting the following classification, I give the results as sent in. You will note, however, that some of the figures verge upon the impossible. It is not within the province of this report to distinguish between the correct and the incorrect, but rather to place before you, in as concise a manner as possible, the substance of the replies received.

1. What appliances do you use for generating blast for your cupola, fan or pressure blower?

To this question thirteen firms replied that they were using pressure blowers, and seven, that they were using fans. It may be interesting to note in this connection that of the forty-six foundries in the list published by Mr. West in the 1896 edition of his book, thirty-three used fans, and thirteen pressure blowers. If we consider these figures as representative, there has been a decided tendency in the last eight years towards pressure blowers.

2. State what power you use to drive your fan or blower, electric or steam, and give name and number, or size of fan or blower you use?

Seventeen replied to the first part of this question; of these, eleven used electricity for driving their fans and blowers. Two were direct-connected, five were belted to an electrically driven shaft. Four did not state the method of applying the power. Six used steam power; of these, three were directly connected to the engine, two were belted to a shaft, and one not stated. One used a gas engine. In reply to the second part of the question, one stated that they were using a number six fan, one a number seven, two a number eight, one a number nine, three number eleven and one-half, and one a number twelve. The number of blowers used were: one number four, three number seven, one number five and one-half, one number eight, one eighty-six foot, one forty-eight foot, one twenty-four foot. Three did not state the size of their blower. It is difficult to make comparisons in the above, as I have not been able to obtain catalogues of all the makes represented. I have thus been prevented from giving all the figures and sizes, which would have been much more satisfactory.

3. Send rough plan and side view sketch of the position of our cupola, fan or blower, showing the diameter and length of all piping, also the form and bends of elbows, as well as the diameter of the fan's or blower's outlet and the cupola's opening that connects with the main piping; also state what kind and mark position of blast gauge on above sketch if you use one. Also give inside diameter of your cupola.

It would be impracticable to give, in a report like this, any complete idea of the drawings and sketches submitted in answer to this question. These will, without doubt, be later submitted to the association for their inspection. The sketches showed all sizes, methods and differences imaginable, one blower being placed one hundred and twenty-three feet from the cupola. There was absolutely no uniformity in regard to design or methods used in connecting the blowers or fans to the cupola. The inside diameters of the cupolas were as follows: Two 42-inch cupolas, four 44-inch, one 46-inch, three 48-inch, one 54-inch, one 58-inch, four 60-inch, one 62-inch, two 64-inch, two 66-inch, one 72-inch, and one 84-inch.

4. Give blast pressure at two or more intervals during a heat, and state from your observation the highest pressure your fan or blower is capable of producing.

5. State revolutions of fan or blower at any given time and the amount of horsepower required at the same intervals in connection with your blast pressure if you can.

The answers to these questions were so intimately associated that I have classified them together. I include a table which shows the size of cupolas, size of blowers or fans, horsepower required, and the number of ounces pressure obtained. I have also included the number of revolutions whenever they were given. I have divided the horsepower by the number of ounces pressure obtained in order to get an arbitrary figure for the sake of comparison. The highest horsepower per ounce pressure given was one to four and four-tenths horsepower for the blower, and one to four and three-tenths horsepower for the fan. Both these were used on 60-inch cupolas. The lowest horsepower per ounce pressure was one and four-tenths horsepower per ounce on a 48-inch cupola where a blower was used; the next was one and seven-tenths horsepower per ounce on a 48-inch cupola, where a blower was also used. The lowest horsepower per ounce for a fan was one and nine-tenths horsepower. The average horsepower per ounce in the foundries using blowers was two and seventy-eight hundredths, and for those using fans, three and two-tenths. Inasmuch as blowers were used on all the larger size cupolas, these returns very much favor the blower.

Diam. cupola in inches.	Blower. Size.	Fan. Size.	H. P.	Revolutions.	Pressure in ounces.	H.P. per ounce.
84	86 in.		60		16	3.52
72	68 in.		50		18	2.72
66	45 in.		41	189	16	2.57
66	No. 7		25		15.5	1.63
64	No. 6				14.5	
64	No. 7			160	14.5	
62		No. 11.5		1546	9	
60	No. 7		60	68	13.5	4.44
60		No. 12	43	190	11	3.94
60		No. 11.5	44	1780	12	3.66
60		No. 11.5	34	1769	8	4.25
58	No. 5.5		37	232	9	4.11
54	68 in.		50		18	2.78
48			17	190	12.5	1.36
48	24 in.		25	225	14	1.72
48		No. 9	26	1750	10.5	2.48
46		No. 7	20	2500	10	2.00
44		No. 8	40	1546	9.5	4.21
44		No. 6	20	2800	10.5	1.90
44	No. 5.5		20	142	10.5	1.90
44	No. 6			156	8	
42	No. 6			120		
42	No. 4			213		

6. State whether you use coke or coal, or a mixture of both, in your cupola for melting.

Seventeen reported as using coke alone, and two as using a mixture of coal and coke.

7. If you have changed from fan to pressure blower at any time, give your reasons for having done so, also any tests that have led to these conclusions. In general the association would like your opinion of the advantages of fan and pressure blowers, if you have had any experience in using both.

Some three of four of those who replied had changed from a fan to a blower, but none reported as having changed from a blower to a fan. A few of the reasons given for these changes might be interesting. One reports that he had two 54-inch cupolas running alternately; to furnish the power for the same, he had two 48-inch fans. These were connected with a 40-h. p. engine. Even when he had connected both fans independently to the cupolas and divided his wind box so that he could not direct one fan against the other, he could not get sufficient wind. He replaced the two fans with one 68-inch blower, and used a 50-h. p. motor, and everything worked satisfactorily. Another gave as his reason for changing from fan to blower that he could increase the blast capacity without increasing the size of his engine or boiler. Another changed from fan to

blower on acount of the annoyance caused by a slipping belt. He also stated that there was a great saving of power and that he was able to gear his blower directly to a motor. Another changed from a fan to a blower because a blower used less power.

8. State if at any time in your experience the base suggested for standard tests in paragraph 8 and 9, Mr. West's enclosed paper, would have proved beneficial to you, and also if you would approve of such being established for the benefit of trade.

With two exceptions, the answers to this question were all in the affirmative. One of these stated that he considered that the horsepower was too high for a standard. While the most of the writers signified that they considered that such standards would be a benefit, it is rather doubtful whether they really understood what this meant, as those who had blowers voted in the affirmative as well as those who had fans.

REMARKS.

It has been proven without a question that the fan for certain purposes has a greater efficiency than the blower, but what we are directly concerned with now is has it a greater efficiency for cupola work? We must take into account the amount of metal melted per hour, temperature of the metal, and the fuel consumed, as well as the original cost of the fan or blower, the depreciation and power required to run it.

The answers sent in are of little or no help in solving this problem. Mackintosh, Hemphill & Co. have undertaken to determine which is most efficient at their works, the positive pressure blower or the fan. The committee on fans and blowers of the Pittsburg Foundrymen's Association has secured for them the use of the Connersville blower and a Sturtevant ffan for this test. Eveything will be done to make the test a representative and satisfactory one. All the features of cupola practice which could in any way affect this problem will be taken into account in deciding which is the more desirable for foundry purposes.

OBITUARY.

Charles Parkin, one of the pioneer manufacturers of this country of high grade crucible steel, and who had much to do with its development, died at his home, Oak View, New Kensington, Pa., on Friday, May 27. He was born in Sheffield, Eng., in 1838, and at an early age became an expert in the manufacture of crucible steel. In 1864 he came to this country and secured employment with the Hussey-Howe Co., of Pittsburg, and introduced the English methods of crucible steel manufacture. He remained with this concern for ten years and then became connected with Reuben Miller and others of Pittsburg, who built the Crescent Steel Works. The firm was known as Miller, Metcalf & Parkin. This plant is now owned by the Crucible Steel Co. of America. At New Kensington he was one of the organizers of the Pittsburg Tin Plate Co., and remained its president until purchased by the American Sheet & Tin Plate Co. He was also one of the organizers of the Solid Steel Tool Co., of Pittsburg. Four years ago he retired from all manufacturing pursuits, and owing to feeble health retired to his country home, where he lived until his death. He is survived by his wife and six children.

Thomas Murphy, of Detroit, owner of the Murphy Iron Works and the Russel Wheel & Foundry Co., of that place, died at Phœnix, Ariz., on Monday morning, May 23. Deceased was born in Ireland 69 years ago and went to Detroit at an early age. For many years he was interested in the Murphy Wrecking & Salvage Co., having retired only three years ago from active interest in this concern. In 1880 he established the Murphy Iron Works and in 1892 he purchased the plant of the Russel Wheel & Foundry Co. He is survived by his widow and one daughter.

Henry H. Hendricks, a member of the firm of Hendricks Bros., metal dealers, New York, died May 27 from heart disease. Mr. Hendricks was 44 years old. He was a member of the Engineers' Club and the American Association for the Advancement of Science.

William R. Edwards, superintendent of the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., died of apoplexy on Wednesday morning, May 25. He was born in Wales, May 23, 1853, and came to this country at an early age. For a number of years he was employed in an official capacity at the Edgar Thomson plant of the Carnegie Steel Co., and twelve years ago went to Youngstown and later accepted the position of master mechanic of the Ohio plant. About a year ago he was advanced to the position of superintendent. He is survived by his wife and six children.

David R. Fraser, one of the founders of the company known as Fraser & Chalmers, now a part of the Allis-Chalmers Co., died of apoplexy Monday, May 30, at his residence, 1245 Washington boulevard, Chicago, aged 80 years. Mr. Fraser was born in Berwick-on-the-Tweed, Scotland, and came to Chicago in 1848. He first became identified with the firm of Gates & McKnight, which, before the civil war, became Gates, Warner, Chalmers & Fraser. At the close of the war the firm was merged into the Eagle Works Mfg. Co., of which concern Mr. Fraser became superintendent. In 1872, following the great fire, the enterprirse was reorganized as Fraser & Chalmers, under which name it was incorporated in 1890. In 1891 the business had grown to such proportions that Mr. Fraser went to Great Britain, and erected at Elith, on the Thames, a great plant to care for the corporation's European business. Mr. Fraser retired from business in 1893. His widow and three children survive him.

The death of Phineas Barnes on May 29, after an illness of several years, removes one of the last of the pioneers of the steel industry in the United States. Mr. Barnes was born in Portland, Me., Jan. 10, 1842. He entered the works of the Portland Locomotive Co., as an apprentice, in 1858, going from there two years later to the famous Novelty Iron Works in New York, where he remained from 1860 to 1864, and after a course in the Cambridge Scientific School, graduated at the Troy Polytechnic Institute in 1867. He then entered the employ of the Trenton Steel & Iron Co., and in January, 1869, went to Troy to assist the late Alexander L. Holley in the rebuilding of the Troy Bessemer Steel Works, which had been destroyed by fire. When the Troy works again went into operation Mr. Barnes went abroad in Mr. Holley's interest, spending nearly two years in Europe and making the acquaintance of many of the prominent steel men of the time. Returning to the United States he went to Joliet, Ill., to take charge of construction for the Joliet Iron & Steel Co., of which Mr. Holley was the engineer. He removed in March, 1873, to Pittsburg, to become constructing engineer of the Edgar Thompson Steel Works, going afterward to New York, where he had charge of Mr. Holley's office. In 1878 he became chief engineer of the Springfield Iron Co., of Springfield, Ill., of which Mr. Holley was consulting engineer, remaining there until the end of 1882. In 1883 he took charge of the uncompleted works of the Washburn Iron Co., and after finishing them designed and built, in 1885, the steel works of Jones & Laughlin, at Pittsburg, remaining in charge of them, as manager, until April, 1892, when his failing health compelled his retirement. Mr. Barnes' long connection with the steel making industry, his close acquaintance with nearly every prominent man in the practical part of the business, combined with his wide experiencce, caused him to be much sought after by those in search of information bearing on steel works history.

Detroit Foundry Supply Co.

On June 1, E. J. Woodison and L. A. Crandall severed their connection with the S. Obermayer Co. to embark with W. F. Bartlett in the foundry supply and fire brick business under the name of the Detroit Foundry Supply Co. Mr. Crandall has been with the S. Obermayer Co. for three years and previous to that was with Byram & Co. in the foundry equipment business. Mr. Woodison has been in charge of the S. Obermayer Co.'s Detroit office and fire brick department for six years, covering territory in Ohio, Indiana and Michigan, and editing the *Obermayer Bulletin*.

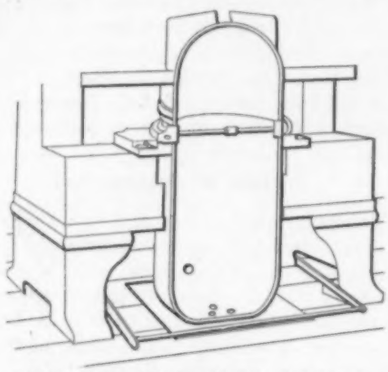
The Amalgamated Association conference committee on the puddling and finishing scale for 1904-5 will meet with a committee of the iron manufacturers on June 7, at Cambridge Springs, Pa. No date has yet been fixed for holding the conference on the sheet and tin workers' scales, but it is probable that they will be held before the middle of this month.

SOME NEW EXAMPLES OF PRESS WORK.

The Toledo Machine & Tool Co., of Toledo, O., has recently devised a new method of forming float balls for wash down closets. The balls, instead of being spun into shape, are made complete with dies on a Toledo open back inclinable geared power press No. 5. Each half of the ball is drawn in two operations and the outside edges are afterward trimmed and folded. The two halves are then clamped together by means of a closing die. In this closing die, a very ingenious device is used which closes the halves of the bell so tightly together that very little solder is necessary to make the ball air tight. The floats are produced in a much neater and smoother manner by this method than by spinning them into shape and are produced at from 50 to 60 percent less labor cost with the dies than is possible with the old method. Another advantage is, no great expense or outlay is necessary to put in an equipment for doing this class of work.

Among the more recent achievements of this firm in the press working of sheet metals is the making of bath tubs entirely of pressed steel. They must of course be made in large numbers to warrant the outlay for presses and dies, but when the apparatus is all provided the product is not only cheap but excellent, with novel and desirable features of its own. In the making of such articles as bath tubs, the sizes of the parts and the power required in the operations constitute a large factor of expense and involve additional difficulties of manipulation.

The company has recently produced an entire equipment of shears, presses and dies for this work, making the entire tub, its legs, overflow pipe and fittings. The entire body of the



FINAL OPERATION IN MAKING BATH TUB.

tub is made of but three pieces. The rim or top of the tub, instead of being a detached piece, is made integral with the body and ends, this feature involving one of the few difficult sheet metal problems which are now receiving practical soluiton.

The blank for the rear end of the bath tub is first cut to shape with ordinary cutting dies, and in the second operation it is formed to the proper radius in ordinary sheet metal forming rolls. The power press built for this special work comes in here and in this the operation of curling or forming the top edge is done. A second set of dies flattens or forms the rim at right angles and a third operation curls over the outer edge and finished the shaping. The first operation was by far the most difficult. No blank holders or pressure rings were used in forming the edge, the operation showing how surprisingly the metal can be made to fold or flow if the dies are correctly adapted to the work. Additional dies next prepare the edges for seaming, one operation bending the edge at a right angle all around and a second operation throwing it over about 45 degrees more, when it is ready for seaming to the body of the tub.

The body for the front end piece of the tub having been cut to proper shape, has its top edges shaped in two strokes of the press and with but one set of dies; this being accomplished by a special gage or locating device operated by a hand lever. The upper die descending forms the first bend when by the operation of the one lever the gage is thrown out of the way, permitting a second set of gages to come into play by which the sheet is so located as to form the second bend and complete the rim.

The body is then shaped by rolls to match the already prepared ends and the edges are bent out at right angles.

In the assembling operation the rear end piece is first placed in position over the corresponding end of the body piece and the two are placed in the dies and at one stroke of the press they are neatly and firmly seamed together.

The front end of the tub is next placed over the front end of the body, then they are placed in the dies and seamed in the same way, this operation being shown in the illustration. The press employed for this work is made with an open or removable front which makes it possible to place the tub in the position shown.

Attention should be called to the manner of securing the seamed joints in the rim. A surplus of metal is left on each edge and by means of dies this is notched, shaped and perforated, the operations being performed simultaneously with those previously described. The shape of the body of the tub allows the legs to be made alike and these are produced complete in six operations for each. The making of the overflow pipe, which it is not necessary to describe, completes the job.

NEW BOOKS.

The first volume of "Ready Reference Tables," by Carl Hering, has been received. The various measures employed by engineers and physicists are given, with their values in terms of such of the other as they are likely to be converted into in practice. The reciprocals of the quantities are also tabulated in order that the calculation involving the conversion of one measure into another can be reduced to a simple multiplication. The more usual foreign units and measures have been added. The work is not a compilation but has been recalculated by the autnor and his assistants and the authority for fundamental values is given in each case. The volume is not entirely a succession of tables as there are many brief articles relative to the various standards (these are especially complete in connection with electrical units); over a page is given up to the matter of reducing formulas from one kind of units to another; the C. G. S. system and the decisions of International Electrical Congresses relating to units and definitions have each a concisely prepared article. The tables are not lacking in numerous practical notes and suggestions. They are carried out to six places and the logarithms to seven. The index is extensive and there is a condensed list of the most frequently used values with page references to the others. This list appears conveniently on the inside of the cover and the two following pages. The book is announced as the first in a series by Mr. Hering of data collections. It is admirably bound in gold-lettered morocco, is 4¼ x 7 inches with 214 gilt-edged pages. Published by John Wiley & Sons, of New York. Price, $2.50.

"Rustless Coatings," with the subtitle "Corrosion and Electrolysis of Iron and Steel," is largely a collection of information on the composition of many paints for ferric structures and the results that may be expected of them. The author, M. P. Wood, from 1894 to 1901, prepared a number of papers on rustless coatings and these have been rewritten and much new material incorporated. The subjects are so grouped in the volume and detailed in the index that the data are readily obtained and the author's conclusions and analyses easily found. The many engineers who have followed the vigorous arguments of Mr. Wood in his papers before the American Society of Engineers will be interested in this extended survey of a most important subject, the stability of steel structures under various paints, etc. The book is 6 x 9 inches, has 442 pages with many illustrations and is published by John Wiley & Sons, of New York. Price, $4.

A handy sketch pad for making drawings in isometric projection comes from the Derry-Collard Co., of 256 Broadway, New York. The sheets are ruled with faint blue lines at right angles as well as in the two diagonals. This system of sketching is accepted generally as the most practical method of depicting objects in perspective and the accurately ruled sheets allow of drawings to scale along any of the axes. The sheets can be obtained in pads of fifty as follows: 6 x 9 inches at 25 cents; 9 x 12 inches at 50 cents; and in loose sheets, 12 x 18 inches, 5 cents each or 50 for $1.

Well-Known British and American Engineers.

The joint meeting of the Institution of Mechanical Engineers and the American Society of Mechanical Engineers at Chicago, this week, brings together men who have been leaders in their profession, and the list of attendants includes names known on both sides of the Atlantic in connection with specific achievement in engineering. It will be interesting to our readers to know something of the personnel of the visiting contingent as well as of the management of the society they represent. We accordingly present portraits and brief sketches of some of the prominent members of the Institution of Mechanical Engineers, following these with a group of the officers of the American Society of Mechanical Engineers and some biographical notes:

J. H. WICKSTEED.

EDGAR WORTHINGTON.

J. Hartley Wicksteed, President.

J. Hartley Wicksteed, president of the Institution of Mechanical Engineers, is chairman and managing director of the firm of Messrs. Joshua Buckton & Co., Leeds, who are noted for the manufacture of machine tools, armor plate finishing machines, large lathes, drilling and boring machines, and chain and anchor testing equipment. They are makers of the Wicksteed universal testing machine. Mr. Wicksteed was elected president in 1903, this being his second year of office.

Edgar Worthington, Secretary.

Edgar Worthington, secretary of the Institution of Mechanical Engineers, was born in the county town of Lancaster and educated there and at Owens College, Manchester, where he graduated in Science at the Victoria University. Served apprenticeship in the Crewe Works where he gradually rose to be assistant works manager in the locomotive department of the London and North-Western Railroad Co. Was for thirteen years with Beyer, Peacock & Co., locomotive builders, and during this time spent a year in a journey round the world. He became secretary of the Institution of Mechanical Engineers in 1890 when the new house was under erection in St. James' Park. Mr. Worthington has twice visited the United States. From 1881 to 1883 he was employed at Altoona, the Baldwin Locomotive Works, the Rhode Island Locomotive Works, and under the late Howard Fry assisted in designing the rolling stock of the New York West Shore & Buffalo railroad. He was also a visitor at the Columbian Exposition at Chicago in 1893.

Wm. H. Maw.

William H. Maw, president of the Institution of Mechanical Engineers 1901 and 1902. Joint editor with James Dredge, C. M. G., of *Engineering* since 1866. Received his professional training in the works of the Great Eastern Railway, 1855-65.

W. H. MAW.

E. WINDSOR RICHARDS.

He is treasurer of the Royal Astronomical Society, and has been president of the British Astronomical Association.

E. Windsor Richards.

E. Windsor Richards, justice of the peace, was president of the Institution of Mechanical Engineers, 1896 and 1897. Has been president of the Iron and Steel Institute and in 1902 was high sheriff of Monmouthshire. Formerly manager of the famous Low Moor Iron Works, Bradford, Yorkshire, and manager of Bolckow, Vaughan & Co.'s Iron & Steel Works, Middlesbrough, and now a director of Messrs. Guest, Keen & Nettlefold.

John W. Spencer.

John W. Spencer, member of council, is connected with the Newburn Steel Works, Newcastle-on-Tyne, the property of John Spencer & Sons. Although the plant was founded by John Spencer in 1810, the name of Spencer is closely associated with the successful production of modern details of engineering practice. The founder was a maker of files, and this branch is still carried on at the Newburn Works. The development of Newburn Steel Works followed the introduction of the railway system, the manufacture of forgings, springs, castings, etc., being extended the spring trade expanding on the adoption of Baillie's volute spring in place of laminated springs by many engineers. The introduction of the steamship and its development again led to a considerable expansion of the Newburn Works, and the forges were shifted and enlarged to meet the modern demand for large crank and other shafting, gun work, etc., and were provided with large hammers and furnaces, also with a hydraulic forging press. In 1866 the manufacture of steel castings was taken up as a specific business and developed for all purposes, the material being comparatively hard. In 1891

J. W. SPENCER.

J. ETHERINGTON.

W. G. KIRKALDY.

E. J. CHALMERS.

rolling mills were opened for the manufacture of the largest boiler and ship plates. The number of men employed is 1,500.

John Etherington.

John Etherington, of London, has followed the practice of consulting engineer for some 26 years. He was formerly with the Tyneside firm of Robert Stephenson & Co., and was also for several years with Maudslay, Son & Field, marine engineers of London, and has been chief of the iron and steel

D. ADAMSON.

JOHN BARR.

department of the Great Western railway. In addition to his consulting practice he is a manufacturer of engineering specialties inclusive of lubricating oils. He is a member of the Institution of Mechanical Engineers, the Society of Engineers, the North-East Institution of Mining and Mechanical Engineers, the Institution of Naval Architects and the Iron and Steel Institute.

Wm. G. Kirkaldy.

William G. Kirkaldy is the son of the late David Kirkaldy who earned a reputation as the pioneer in systematic testing of materials. Following in his father's footsteps he conducts the testing works his father established in London in 1866. He has thus had special experience in testing, the range of work undertaken comprising practically all kinds of materials employed in engineering construction, though railway material forms the major proportion. A specialty has been made of ascertaining causes of failure in engine details, also in axles, rails, etc. The testing and experimenting works are located in London

E. J. Chalmers.

E. J. Chalmers is managing director of the Tipton Works of Bullers, Ltd. The plant at Hanley, Staffordshire, is devoted entirely to the manufacture of porcelain for high test electrical work; the firm having transformer testing apparatus for insulators up to 60,000 volts; 30,000 to 40,000 volts being a usual test for this make of insulators. Mr. Chalmers for some years has had the eight hour work day at his

J. A. M'LARAN.

J. DRONSFIELD.

plant with five hours on Saturday. He has had a large and varied experience in civil and mechanical engineering.

Daniel Adamson.

Daniel Adamson is a member of the firm of Joseph Adamson Co., of Hyde, Eng., who have been well known as boiler makers for the past thirty years, and during the past ten years, under the personal supervision of Mr. Adamson have developed an important trade in electric overhead cranes, being the first to adopt them in England. Mr. Adamson is a member of the British and the American mechanical and electrical engineers' associations. He took a prominent part in the recent Manchester tool steel experiments, having acted as honorary secretary to the committee and at the joint meeting in Chicago has charge of a paper on the same interesting subject prepared by Dr. Nicolson who is unable to attend. Mr. Adamson is 35 years old.

WM. TARTT.

E. BAINBRIDGE

John Barr.

John Barr has spent his life in Kilmarnock, Scotland, and with Glenfield & Kennedy, Ltd. He entered the employment of that firm 37 years ago at 12 years of age, has been secretary of the company for 25 years and is now a director. The business has been the manufacture of valves, hydrants, meters, pumps and other hydraulic machinery and at present about 1,900 workmen are employed. Mr. Barr is a member of the Institution of Mechanical Engineers, the Shipbuilders of Scotland and of the West of Scotland branch of the Iron and Steel Institute.

William Tartt.

William Tartt, of So. Godestone, Surrey, was born in 1832, the son of the millwright at the Coalbrookdale Iron Works near Wellington, Salop, Eng. Received a grammar school education, was followed by an apprenticeship at the above works. Six years later he was with Batley's Works at Northampton and went thence to Wolverton in 1856 in charge of the repair department. In 1859 entered the employ of J. & G. Rennies and for many years engaged in the construction of gunboats in Prussia and Arabia. In 1867 was superintendent of construction at Bagdad for the Euphrates & Tigris Steam Navigation Co., and built a number of steamers for the company, but retired in 1884. Has since made a number of trips to Persia for the same firm and to dock and repair steamers.

G. R. DUNELL.

ALFRED SAXON.

Emerson Bainbridge.

Emerson Bainbridge has been a mining engineer since 1869. From 1870 to 1874 was manager of the Duke of Norfolk's collieries in Sheffield, then becoming and remaining the managing director of the company who bought the properties. He is consulting engineer for collieries in Durham, Yorkshire, Derbyshire, Nottinghamshire, Warwickshire, New South Wales and Canada, and a colliery proprietor. Chair-

man of Lancashire Derbyshire and East Coast railway; of Sheffield District railway, etc. Educated privately and at Durham University. Juror at Inventions Exhibition, 1883; and Brussels Exposition, 1897; member of Royal commission on coal dust in mines, 1891; founded shelter for neglected children in Sheffield, 1894; established co-operative village for miners at Bolsover, 1893; Member of Parliament, Lincolnshire, West Lindsay or Gainsborough Division, 1895-1900. M. I. C. E., J. P. Joined the Institution of Mechanical Engineers in 1869.

J. A. M'Laran.

J. A. McLaran is general manager of Messrs. J. & H. McLaran, engineers, of Leeds, England. The firm is a manufacturer of steam engines for electric generation and for agricultural purposes.

James Dronsfield.

James Dronsfield is managing director of Dronsfield Brothers' Atlas Works, Oldham. He was educated at Broughton Park School, Manchester Grammar School and Rossall College. Served five years with Messrs. Dronsfield Brothers, Oldham, learning the trade of machinist. He is the inventor and patentee of many of the machines manufactured by his firm. He joined the Institution of Mechanical Engineers in 1895.

Geo. R. Dunell.

George Robert Dunell, of London, member of the Institution of Mechanical Engineers, member of the Iron and Steel Institute, consulting engineer, writer on engineering subjects and representative of *Engineering*. Mr. Dunell is known to many American engineers as the special correspondent of the *London Times* who visited the United States in 1899 and subsequently wrote a series of articles for that journal entitled "American Engineering Competition." These were afterwards republished by Harper & Bros.

Alfred Saxon.

Alfred Saxon was born 1859 and educated at the Fairfield Moravian Academy and Owens College, Manchester, and later entered his father's plant, the Openshaw Engineering Works, in which he is a partner. The firm builds Corliss engines up to 2,500 h. p. and also carries on a general consulting practice at Manchester. In addition to his membership in the Institution of Mechanical Engineers, Mr. Saxon is president of the Manchester Association of Engineers, the engineering executive committee of the Manchester Chamber of Commerce, a life member of the Owens College Engineering Society, and a vice president of the Heginbottom Technical Engineering Society at Ashton-under-Lyne.

Ambrose Swasey, President A. S. M. E.

Ambrose Swasey, president of the American Society of Mechanical Engineers, was born in Exeter, N. H. His educational training was in the district school and at 18 he entered upon the machinist's trade. In 1870, in company with his present partner, Mr. Worcester R. Warner, he entered the employ of the Pratt & Whitney Co., at Hartford, Conn., and while in charge of their gear department invented and perfected the epicycloidal milling machine for the production of the true theoretical teeth of gears. Mr. Swasey subsequently invented a new process of generating and cutting the teeth of spur gears. In 1880 he resigned his position with the Pratt & Whitney Co. and with Mr. Warner established the Warner & Swasey Co. in Cleveland. Mr. Swasey's ability as a mechanical engineer combined with Mr. Warner's taste for astronomical pursuits led the firm to take hold of the manufacture of the mathematical instruments utilized in astronomy. The Lick telescope in California, the meridian circle and equatorial instruments at the Naval Observatory at Washington and the Yerkes telescope at Lake Geneva, Wis., are specimens of the skill placed at the service of the astronomer. Mr. Swasey is a past president of the Civil Engineers' Club of Cleveland, a charter member of the American Society of Mechanical Engineers and member of the Institution of Mechanical Engineers.

F. H. DANIELS, Vice-President
WM. H. WILEY, Treasurer
D. S. JACOBUS, Vice-President
JAMES CHRISTIE, Vice-President
AMBROSE SWASEY, President 1903-'04
M. L. HOLMAN, Vice-President
JOHN R. FREEMAN, Vice-President
F. R. HUTTON, Secretary
WILLIAM J. KEEP, Vice-President

OFFICERS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

F. R. Hutton, Secretary.

Frederick Remsen Hutton, secretary of the A. S. M. E. was born in New York city in 1853. He was educated at Columbia College, receiving the degree of Civil Engineer in 1876, an dthe honorary degree of Ph.D. in 1881. At the reorganization of the engineering department of the School of Mines of Columbia University in 1877, he was made Instructor in mechanical engineering, adjunct professor in 1882; full professor in 1891. In 1883 he was elected secretary of the American Society of Mechanical Engineers, which office he has held continuously. In 1880 he prepared elaborate monographs for the 10th Census, covering machine tools and wood working machinery, pumps and pumping engines. Author in 1897 of "Mechanical Engineering of Power Plants," "Heat and Heat Engines" in 1899; the "Gas Engine," 1903. Editor of the department of mechanics, *Engineering Magazine;* associate editor Johnson's Universal Encyclopædia; technical editor Century Dictionary. In 1899 made dean of the faculty of applied science, Columbia University.

Wm. H. Wiley.

William Halsted Wiley, of East Orange, N. J., treasurer of the American Society of Mechanical Engineers, was born jn New York in 1842. He entered what is now the College of the City of New York in 1856, and received the degree of A. B.; joined the Union Army and served until 1864; went to Rensselaer Polytechnic Institute, Troy, N. Y., and graduated in 1866 as civil engineer. Followed that profession for several years, and then took a special course in mining at the Columbia College School of Mines, and became superintendent of a mine, remaining several years. At the request of his father, entered his publishing business as a partner in 1876. In the

International Exposition at Brussels, in 1897, was president of one of the juries and a member of the superior jury and is a member of the New Jersey commission for the Louisiana Purchase Exposition. He was elected to the 58th congress.

M. L. Holman.

M. L. Holman graduated in June, 1874. In the next three years was master mechanic on alterations of United States customs house, Boston, Mass.; assistant superintendent United States customs house and postoffice, Chicago, and in office of Flad & Smith, civil engineers. From 1877 to 1887 with St. Louis water department; 1887 to 1899, water commissioner of St. Louis; 1900 to 1904, general superintendent Missouri-Edison Electric Co.; Jan. 1, 1904 to date, with Union Electric Light & Power Co., also engaged in general consulting practice in the firm of Holman & Laird, consulting engineers.

Fred H. Daniels.

Fred Harris Daniels was born in 1853 and has been a resident of Worcester, Mass., from 1854. He had a public school education and attended Worcester Polytechnic Institute. In 1873 and 1874 he was in the employ of the Washburn & Moen Mfg. Co., serving as draughtsman, chemist and mechanical engineer. In 1877, in the interest of the company, he made a tour, studying the Swedish methods of producing choice qualities of iron and steel, and thoroughly investigating the French, German and English methods of rolling wire rods and producing wire. He became general superintendent and chief engineer. In 1898 he went with the American Steel & Wire Co. as chief engineer, on the sale of the Washburn & Moen Co.'s interests.

James Christie.

James Christie, chief of the mechanical engineering department of the American Bridge Co., was born near Ottawa, Can., Aug. 28, 1840, of Scotch parents. At an early age entered a locomotive plant at Detroit, Mich., as a machinist's helper. He finished his apprenticeship with I. P. Morris & Co., of Philadelphia. From 1872 to 1876 he was engaged in construction and designing of bridges at Phillipsburg, N. J. He became mechanical engineer of the Pencoyd Iron Works, Pencoyd, Pa., and served as chief of the department until its absorption by the American Bridge Co. Mr. Christie is a member of the American Society of Mechanical Engineers, the American Society of Civil Engineers, a fellow of the American Association for the Advancement of Science, member of the Engineers' Club of Philadelphia, the Franklin Institute and Grand Army of the Republic. He was awarded the Norman medal by the American Society of Civil Engineers in 1884.

William J. Keep.

William J. Keep, of Detroit, was educated at Oberlin, O., and at Union College of Schenectady, N. Y., at the latter taking the degree of civil engineer. Before going to Union College he learned the trade of a machinist at the Globe Iron Works of Cleveland. After graduation he took charge of the stove works of Hubbell & Brother, of Buffalo, and two years later became superintendent of the stove manufacturing plant of Fuller, Warren & Co., of Troy, N. Y., acting in that capacity until 1876, when he engaged in the same line of business on his own account. For several years after removing to Troy he gave a course of lectures on the steam engine to the senior class of the Rensselaer Polytechnic Institute. Since 1884 he has been general superintendent of the Michigan Stove Co.'s works at Detroit. Mr. Keep is a fellow of the American Association for the Advancement of Science, a member of the American Institute of Mining Engineers and American Society of Mechanical Engineers. He is also a member of the Iron and Steel Institute, the International Association for Testing Materials, American Foundrymen's Association, Franklin Institute, and has been president of the Detroit Engineering Society. He is an honorary member of the Rensselaer Society of Engineers and of the Philadelphia Foundrymen's Association.

Professor David Schenck Jacobus.

Professor David Schenck Jacobus was born in Ridgeway, N. J., in 1862. Won in competition examination a free scholarship in Stevens Institute, graduated M. E. in class of 1884 and appointed instructor in department of experimental mechanics. Instructor and assistant professor to 1897 and then advanced to full professorship and in charge of department of experimental mechanics and engineering physics. He is a member of the American Society of Mechanical Engineers, Society of Naval Architects and Marine Engineers, American Society of Mining Engineers, American Mathematical Society, Society for the Promotion of Engineering Education, American Association for the Advancement of Science, Franklin Institute, New York Railroad Club, the Engineers' Club and the Holland Society of New York, and is an associate member of the American Institute of Electrical Engineers. In 1900 was elected a manager of the A. S. M. E. and became a vice president in 1903.

John R. Freeman.

John R. Freeman, of Providence, R. I., has been a member of the American Society of Mechanical Engineers since 1887. He is president of the Manufacturers' Rhode Island and Mechanics' Insurance Companies of Providence, R. I., and is also in practice as a consulting hydraulic and mill engineer. Mr. Freeman is prominent in the American Society of Civil Engineers and was selected to represent national engineering organization at the recent installation of President Howe, of the Case School of Applied Science, at Cleveland.

Reorganization of Consolidated Lake Superior Co.

The reorganization of the Consolidated Lake Superior Co. was consummated last week and a new corporation known as the Lake Superior Corporation is now in control of the properties. The Province of Ontario guaranteed the payment of $2,000,000 of obligations of the Canadian Improvement Co., and these obligations were purchased by Blair & Co. at par. The Lake Superior Corporation commences operations with the capital greatly reduced, the stock amounting to only $40,000,000, $3,000,000 of income bonds and $10,000,000 of first mortgage collateral trust 5 percent gold bonds. The aggregate of securities now outstanding amounts to $53,000,000.

The annual report of the Wm. Cramp & Son's Ship & Engine Building Co., of Philadelphia, shows a surplus after interest, etc., of $188,174, which compares with $179,198 last year. In the latter year, however, $121,200 was paid out in dividends, so that this year's surplus is really about $112,000 less than that of 1903. The gross earnings were $7,107,082, as compared with $8,519,169 in the preceding year. The profit was $735,031, as against $696,497. The profit and loss account of the company as of April 30, 1904, shows: Gross from shipbuilding, $4,818,917; gross from other departments, $2,288,165; total gross, $7,107,082; operating expenses, $6,372,050; balance, $735,031; general miscellaneous expenses, $170,573; net profit, $564,457; income from other sources, including interest on deposits and discounts for cash on material bills, $25,608; total net profit, $590,066; fixed charges, interest, etc., $401,891; surplus, $188,174. President Henry S. Grove in his report says: "The past year indicates that there has been little or no profit in shipbuilding proper. Were it not for our subsidiary companies doing business other than that of building ships we would not be able to make this showing. Our position for the coming year, however, is secure in having in all departments contracts aggregating about $13,000,000, which is an increase over the same period of last year of $1,500,000."

To carry an electric power cable to its new cement plant at Buffington, Ind., the Illinois Steel Co. is erecting steel towers 200 feet high on either bank of the Calumet river. The elevation of the cable will permit vessels with the loftiest masts to pass underneath. By carrying the cable through the air instead of along the bed of the river a great loss of electricity is done away with.

Manning, Maxwell & Moore have received an order for five large vertical boring and turning mills from the National Car wheel Co. These tools are to be used in connection with high speed cutting steel.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

A Universal Screw Machine.

This turret lathe is the result of a number of years' experience with screw machinery. The inventor, J. P. Lavigne, of Detroit, Mich., has endeavored to embody in his machine the means for handling work of simple or complicated form and with a series of six or fewer of operations. The idea of the latter being this: That if set up on a three operation job on a six-hole turret machine, three of the holes will be jumped without loss of time and that the work will be turned out as economically as if done on a three holed turret lathe of the automatic type. The builder proposes further to have everything contained in the machine for the production of any piece of work without the necessity of making cams or other parts. Still another feature of importance relates to the skipping of holes in turret work. Many times it is essential that the stock

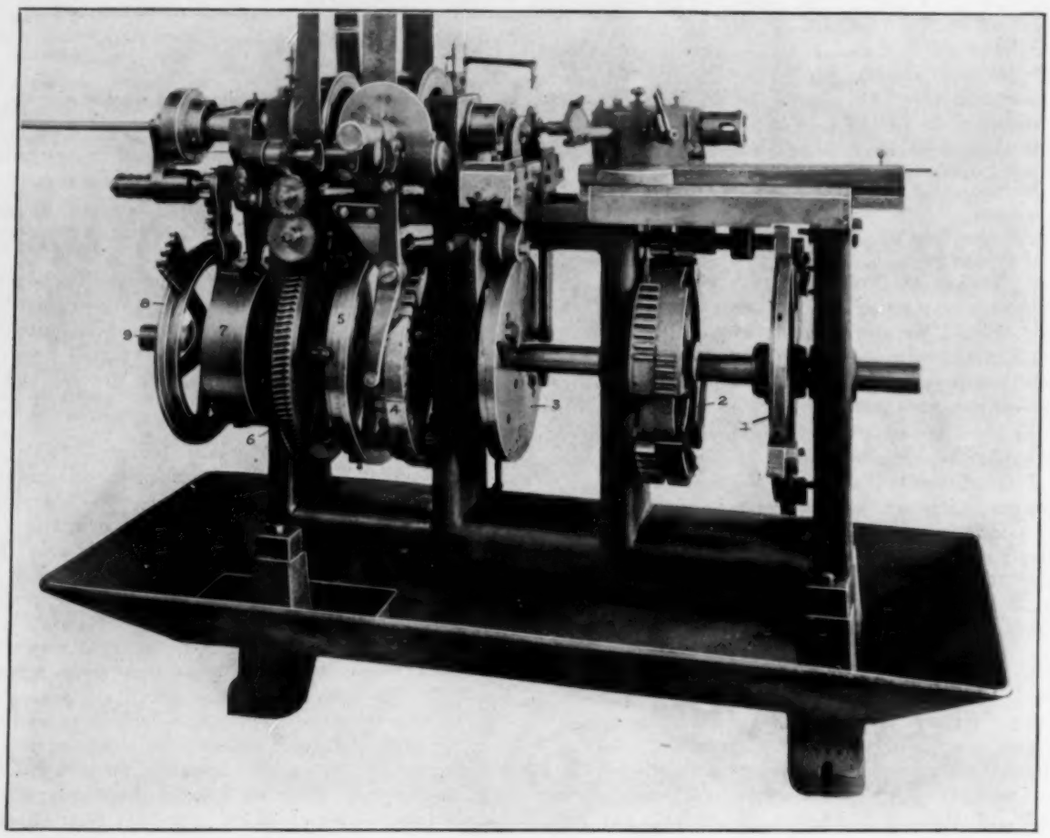


FIG. 1.—A UNIVERSAL SCREW MACHINE.

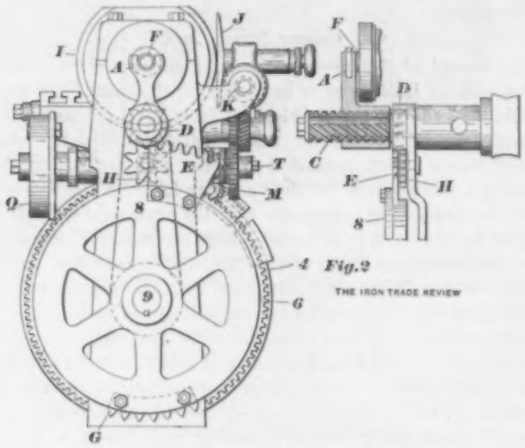
should be cut off between numbers 4 and 5, 3 and 4 or 1 and 2, etc. Provision is made for this contingency and it is only necessary to slip the disc around to the position where the operator wishes the tool to make the requisite cut and then clamp the wheel at that point. This task is even easier than it appears by an inspection of the halftone, Fig. 1. Each of the discs is graduated so that the machine can be set to any special work without the use of an expert workman. A card is made out with the graduations specified for the different setting on any one job and enables the machine to be reset correctly and without experiment.

The several discs and disc shaft on the view illustrated in Fig. 1 are on that and the other engravings designated by numbers. Fig. 2 is an end view of the machine, the smaller engraving being a view of the stock feeding mechanism. Fig. 3 is a vertical section through the machine looking from right to left at 4 in Fig. 1, the small engraving being a detached view of the lower end of the arm depending from the housing of the arbor of the friction disc. Fig. 4 is a vertical section through the machine at 6 in Fig. 1, and Fig. 5 is a longitudinal section through the turret and its driving mechanism.

Beginning with the stock feeding end of the machine and passing in order to the turret we see that the clutch A gripping the stock is connected with a clutch block B having a threaded sleeve riding on a heavy worm C. The stock feeding worm C has a gear at one end D and is journaled upon a stud secured to the frame of the machine. The worm is held in place by a washer and screw abutting against the opposite end of the worm to the gear D. The rotation of the worm first in one direction and then in the other feeds in the stock or takes a fresh grip as required. The worm is rotated in one direction by the action upon the gear wheel D of a segmental rack E which is bolted to a wheel 8 on the shaft 9 at the extreme left of the machine as seen in Fig. 1. The worm C is turned in the opposite direction by a short rack G bolted to the wheel 8 but flush with the periphery and this rotates an intermediate gear H which in turn meshes with the gear D. The wheel 8 rotates in the one direction but the arrangement of racks and gears permits of the worm alternately turning in opposite directions. The clutch collar on the hollow spindle F is operated by cams on the face of the pulley seen at 7 in Fig. 1.

The machine is driven by a constantly operated loose pulley run by a belt in the usual manner. Another pulley is driven in the opposite direction for "backing off" and both are loosely mounted on the hollow spindle F. A sliding clutch between the pulleys couples either of them with the hollow spindle and is actuated by a lever which comes in contact at specified intervals with a cam clip on the wheel 5. The main shaft 9 is driven from the belt pulley which has a friction ring I engaging with a disc J, Figs. 2 and 3. The friction disc J is fastened to the end of a short shaft having one of a pair of spiral gears, the other gear being on the shaft K. The motion

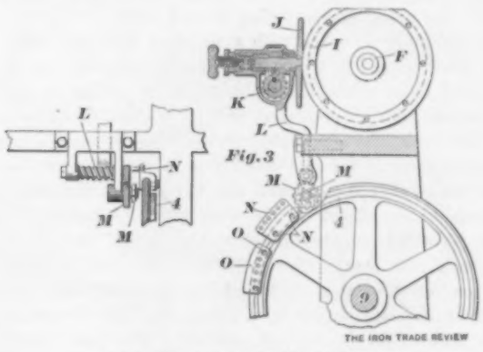
of the disc J is communicated through the shaft K and the train of gears seen in Fig. 4 to the worm gear E on the shaft 9. The regulation of the machine speed is adjusted to the purpose of the operation; cutting will be done at a relatively slow speed and when the tools are not cutting the machine will be run at the highest speed in order to gain all possible economy of time. All this depends again upon the character of each operation as the speed should be varied according to the cutting resistance, etc., and provision is made for adjust-



THE STOCK FEEDING MECHANISM.

ment of the motion to the depth of cut, hardness of metal worked and durability of tools. For the purpose of shifting the point at which the friction disc and ring come in contact and therefore varying the speed of the wheel 6, the housing of the shaft K has a depending arm L, the lower part of the arm having worm teeth in mesh with a worm in a bracket attached to the frame of the machine. The worm is rotated by a pinion M, Fig. 3, which is turned by a pin set in one of a series of holes in the plate N attached to the rim of the wheel 4. The rotation of the worm in the opposite direction is effected by the plate O which drives the pinion M backwards as may be required. This rotation of the worm drives the arm L right or left and thus varies the relative position of the friction wheels and the machine speed.

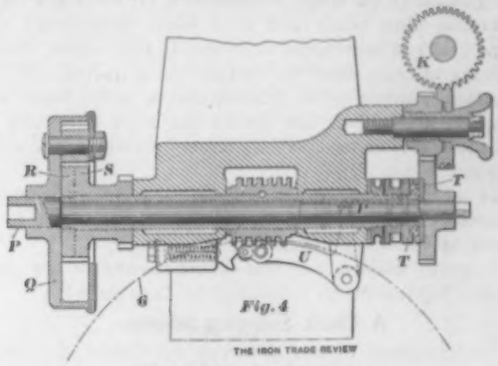
A "planet motion" provides two fast and slow rates of speed in addition to the gradual increments of the friction discs. This motion is illustrated in Fig. 4. It will be seen that there is a frictional connection with the driving discs by a hand nut which prevents the possible breakage of the machine should there be an obstruction. The shaft P has at one end a cup Q containing a stud and pinion in constant mesh with the two gears wheels R and S. These correspond in size very



THE SPEED CHANGING DEVICE.

closely but the former has one tooth less than the gear S. The gear R is attached to the end of a sleeve enclosing the shaft P. The gear S has a projecting hub with ratchet teeth which can be operated through a pawl and a hand wheel. The sleeve has about midway of its length a worm in mesh with a gear 6 which rotates the main driving shaft of the machine. When the power communicated through the shaft P is filtered by way of the "planetary" motion to the worm gear 6 the motion will be very slow for the reason that the complete rotation of the shaft P and the cup Q will only turn the sleeve through a distance represented by one tooth of the gear R In order to drive the shaft at full speed the couplings discs T are operated to attach the shaft and sleeve together, the fork for this purpose receiving the arm of a bell crank lever having one arm U coacting with a cam on the edge of the wheel 5. As will be understood the "planetary" motion is automatically cut in and out of operation and the machine runs fast or slow accordingly.

The turret mechanism which is shown in detail in Fig. 5 has a worm V for moving the slide back and forth. This slide has a depending arm with a threaded bushing at the lowest point and this receives the double threaded worm V.

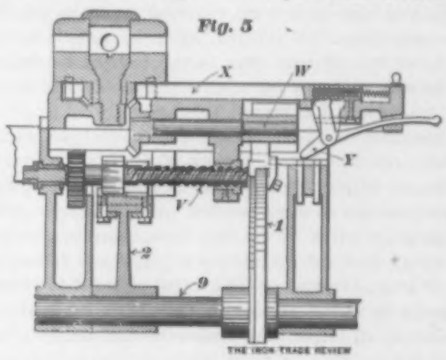


THE "PLANETARY" MOTION.

The pitch of the worm is of course constant and all variations in the speed of the backward and forward movement of the turret are effected by varying the rotative speed of the worm. This differential speed of the screw is obtained from the mechanism already described and which provides for a fast and slow movement as well as a gradual change in either. The wheel 2 bears a short rack which moves the turret in one direction and another rack segment on the same wheel retires the turret after a cutting operation. The turret is rotated step by step by means of a wheel 1 on the main shaft 9. This wheel has a number of cam clips which engage with the teeth of a gear on the shaft W and thereby rotate the bevel gears communicating with the turret. A reciprocating bar X locks the turret and this is released by the cam clip immediately prior to the rotation of the shaft V for turning the turret through another step. The turret can also be unlocked by hand with the lever Y. The cutting tools in the cross slide are driven back and forth across the bed by cams on the sides of the disc 3. The racks acted upon by the levers are capable of adjustment relatively to the tool posts by means of the screws seen in Fig. 1.

The use of the cam clips in this particular form and the

Fig. 5



THE TURRET DRIVE AND LOCK.

substitution of worms for gears are noticeable features in the design of this machine.

The Brazing of Cast Iron.

A process of brazing or welding cast iron which has recently been patented by Joseph E. Tichon, of New Bedford, Mass., is described by the inventor as follows: "For the purpose of brazing two metallic parts the surfaces to be joined are cleaned in any suitable manner, as by dipping them in hydrofluoric acid. Then in following out my process I employ in one or

more of the steps what is termed 'boro-boracic acid' or 'boro-borax.' Generally I prefer to coat the surfaces to be joined with a paste containing boro-boracic acid, finely-divided wrought-iron filings, and water. The metallic parts are then placed and held in proper position and are heated to a red heat. After thus heating the parts, spelter is poured over the joint. This spelter may consist of copper and zinc, with boro-boraic acid added thereto. The parts are then heated to a higher temperature, after which a dry flux of boro-boracic acid is poured over the joint and the parts are allowed to cool, this cooling being hastened by an air blast, if desired.

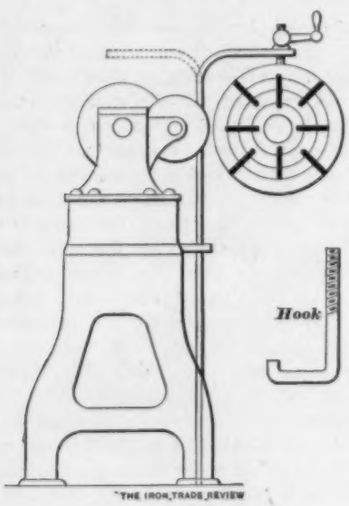
"The boro-boracic acid is a powder which is the product of a mixture of sodium borate and boracic anhydrid in equal parts boiled until the water is evaporated. It melts at a higher temperature than borax and at a lower temperature than boracic acid and intumesces more quietly than either, thereby remaining in place upon the surfaces to be joined. By reason of the quietness of its intumescence it mixes better with the molten iron filings and spelter and more effectively absorbs the oxides formed, besides largely preventing the access of oxygen.

"The paste of boro-boracic acid and iron filings is preferably used in a plastic condition, so that it will adhere to the surfaces to be brazed together."

It is worth while to add that "intumescence" is the patent attorney's equivalent for "swelling" or "expansion."

A Chuck Swinging Scheme.

A correspondent of the *American Blacksmith* describes a handy way of taking off (or putting on) a chuck or face plate



A CHUCK HANDLING RIG.

of a lathe and holding it when removed from the spindle. As will be seen from the illustration it is quite a refreshing change from the old time plan of the hurried workman who has no minutes to waste on a hoist or even on the irregularly efficient assistance of a helper.

"For handling heavy chucks and face plates, this rig is very convenient, much more so than a chain hoist, and it beats three men in lifting a chuck and putting it out of the way where you can get it when wanted. For a 14-inch chuck the crane should be made of 1¼-inch iron. Let the bottom end into a socket or block in the floor. The top fastening is a bracket or brace fastened to the bottom edges of the bed. The hook should be made of ¼-inch iron; this rig will save all kinds of smashed fingers and back-aches caused by lifting the chuck off the floor six or eight times or more a day, also one to two men when a heavy chuck is to be taken off or put on, to say nothing about time, which generally amounts to quite an item in most shops.

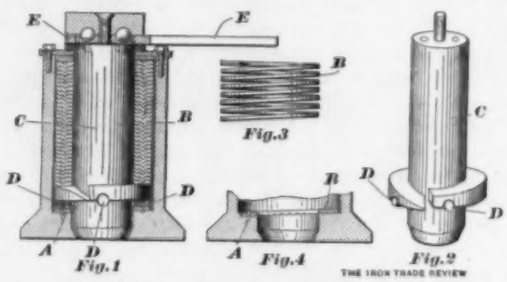
"When you want the chuck on, swing the crane around over the lathe bed until hole in chuck comes level with spindle. If not quite level, raise or lower chuck with lever nut. When chuck is partly on, stop lathe, take hook out and swing crane back out of the way. Then start lathe and screw chuck on all the way."

Another kink from the same source is quite easy to make and will be a very useful implement in the moving of heavy machinery. The principal part of the tool is a large turn buckle. From one end projects a rod, one end of which is threaded to screw in or out of the turn buckle. The outer end of the rod is shaped with a hook on it. Another similar rod is made to screw into the other end of the buckle, and on the far end of this an eye is formed. Fastened in this eye is a ⅜-inch chain three long with a hook on its end, completing the tool. The various parts may be made of any convenient lengths and the tool will be found quite powerful for moving heavy pieces.

A Unique Screw Jack.

The thread of the screw in the body portion of the average screw jack or jack screw is integral with the rest of the screw shank, the ordinary screw being cut from the solid stock. It is possible to conceive of the thread part as a separate piece wound like a spring around a core, the core and spring then forming a sort of screw. If the two were fastened together with the coils arranged in accordance with the pitch requirements we should have a very close parallel with the common screw but for obvious reasons this is not the way screws are usually made. It not infrequently happens that the precise method condemned for the general practice becomes of value for some special purpose and once in a while the end may seem to be most readily reached by discarding accepted customs. Screw jack construction is severe on the supporting screw and the tendency of the designer is to make this of the strongest form that his pitch limitations will permit and this is a difficult union of opposing factors. Rugged strength with the thicker thread is not easily harmonized with increased leverage of the finer pitch, the one has greater friction and the thread on the other is soon stripped.

The invention of M. L. Gaskill, of Columbus, O., has a



IMPROVING THE JACK SCREW.

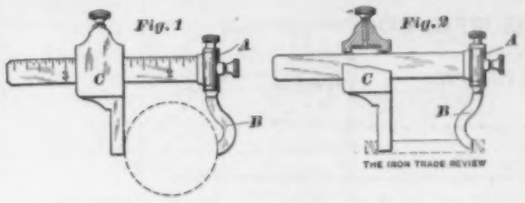
tape-like thread, flat and flexible, wound around the spindle of the jack. Fig. 1 is a vertical section through the jack. Fig. 2 is perspective view of the load supporting spindle, Fig. 3 shows a fraction of a coil or tape constituting a thread, the coil being stretched a little, and Fig. 4 is another fragmentary view showing how the lower coil is attached to the cylinder, the attached end being in end view.

The jack body is made with a shoulder near the lower end of its interior, A, to which the tape constituting the thread is secured by a screw. The thread, B, is a tape or band of steel wound into a cylindrical coil. The thread can be made as shown with a longitudinal corrugation, the convex part of the corrugation of the one coil fitting in the concave corrugation of the next to it to prevent any tendency of the coils in the operation of the device to dislocate laterally and bind either on the cylinder or the spindle. The upper surface of the shoulder at the base of the interior of the jack is made to a spiral curve, starting from a small vertical shoulder, the end of the tape being fastened by a screw near the shoulder so as to lie flush with the curved surface. The load supporting spindle is seen at C. This has at the lower end a projecting portion resembling a section or turn of a thread, the end of the thread section being wedge shaped for the division of the coils and the progress of the projection between them. The projection is shown to be made thick enough to bear the weight of the imposed load. Anti friction rollers D are placed radially in pockets at the under side of the projection. A ring is fastened at the top of the cylinder to hold the coil within the case and the upper end of the thread is left free. The spindle is worked from a pawl and reversible ratchet by a handle E

and anti friction balls can be seated in the grooves of the cap and the ratchet. As the spindle rises the lower coils close on each solidly. Fig. 3 shows the thread as uncorrugated. Some means of preventing the rotation of the threads would seem to be desirable, particularly with the uppermost coils.

An Improvement in Calipers.

The calipers designed by Frank Shafer, of Camillus, N. Y., are for the purpose of sizing two parts, as for example



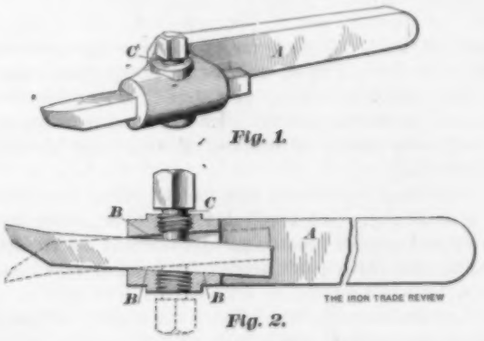
FACILITATING THE TRANSFERENCE OF SIZES.

the fitting of a shaft in a bearing. Fig. 1 is a side elevation of the calipers in position for measuring the diameter of a Fig. 2. is a similar elevation, partly in section, illustrating the device as used for measuring the diameter of a hole.

The flat straight bar has a tubular head A at right angles and this head has a setscrew at the side. A shank fits in the head A and has a jaw or arm B which is reversible and has a face parallel with the axis of the shank. It will be evident from the engravings that the arm B is rotatable in the head and that it may be reversed to present the calipering face inwardly or outwardly as may be desired. The shank has diametrically opposed recesses to receive the inner end of the screw and this holds the arm B in the adjusted position or from further rotary movement. A sliding block C on the bar has a caliper arm having one side for measuring exterior dimensions and the other for calipering interiors. The contact face of the arm B is disposed at one side of the axis of rotation a distance equal to one half of the distance between the two faces of the arm on the block C. It follows that when the arm B is adjusted for measuring the diameter of the shaft in Fig. 1 the arm can be rotated halfway around and will give the diameter of the bore of equal dimensions as in Fig. 2.

Toolholder Improvement.

A simple for mof toolholder is the subject of a patent obtained by Edward A Warburton of Philadelphia. Fig. 1 is a perspection view of the invention with the cutter in place and Fig. 2 is a longitudinal section along the axis of the cutter seat. The toolholder is at pleasure of the workman adjustabel for either right or left hand operation, the reversed position of the tol being shown by dotted lines in Fig. 2. The invention relates to toolholders chiefly designed for lathe and planing tools and A is the shank of the toolholder and the lug in which the cutter is screwed projects at right angles



A PATENTED TOOLHOLDER.

to the end of the holder shank. Through the lug is the opening or seat for the cutter and on the upper and lower sides are the tapped holes for the setscrew C. The tool seat is a passage of rectangular cross section, the two side walls being parallel but the other two opposite walls, B, are ininclined away from each other at the inner end toward the shank of the holdre.

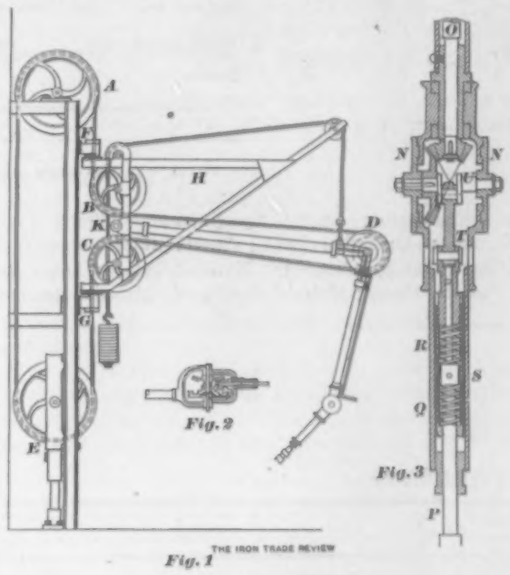
The tool can be placed in the seat to face in either direction for working and when adjusted the setscrew C is turned home against the cutter shank, giving it the proper amount of rake. The seat lug projects laterally so that the tool can be adjusted without removing the holder from its place. The design admits of a substantial construction in cast metal.

Belt Drive for Small Tools.

Felix Fromholt, 32 Boulevard Ornano, Paris, has submitted to the French Society for Encouragement of National Industry, a universal belt drive which has received the favor of the committee.

The sheave A, Fig. 1, is driven in any convenient manner from the source of power. From this pulley a round belt passes over the pulleys B, D, C, and E, then back to A, going, on its way, through holes in sockets F and G, which pivot the frame H, supporting the tool with its joined shaft. This shaft is pivoted in a vertical plane at K and balanced by a weight. The belt tension is maintained by the weight of pulley E, suitably loaded, held in guides and provided with an air cushion to receive the shock if the belt breaks. It is obvious, however, aside from this compensating feature, that the tension of the belt is independent of the position of the tool.

Pulley D is free on its axle, and drives the rotating shaft of the tool by the bevel-gear arrangement shown in Fig. 2.



A BELT DRIVE DESIGN.

The clutch for setting the tool in motion or stopping it is at this point.

The drive is suited to the use of holders for either rotary or percussion tools. A holder for the latter sort is shown in Fig. 3. The rotary movement of shaft O is converted into a reciprocating one by bevel gears and crank V and the connecting rod T, which is not directly attached to the rod carrying the tool, but to a cylindrcal box sliding in the casing. In this box are helical springs Q and R which suport the tool-carrying rod by the ring S. The casing of the toolholder is allowed a swivelling movement on ball bearings, and is also jointed around U in a plane passing through the axis of the tool.

There are sugested several variations of the machine, such as the use of devices to give the percussion tool a rotary, as well as a reciprocating, motion; the employment of friction wheels instead of toothed ones in the holder designed for rotary tools, if intended for high-speed work, or the arrangement of a belt connection from wheel D, doing away with the bevel gears. The entire machine may be attached to a post or wall, as shown in Fig. 1, or mounted on a truck.

The plant of the United States Steel Co., Everett, Mass., was sold at auction last week for $50,000 to the International Trust Co. for the benefit of the bondholders. The sale was made as a foreclosure proceeding under a mortgage held by the trust company. The plant was bonded for $150,000 and has a capital of $300,000. By this sale the bondholders use practically all their holdings.

The Cost of Production in the Machine Shops of the Nordberg Mfg. Co.

BY E. A. BAYERLEIN.

In this article the following forms will be mentioned and referred to as follows: Order Book; Sales Order; Specifications—Engineering Dept.; Specifications—Pattern Dept.; Specifications—Operating Dept.; Specifications—General Office; Change on Specifications; Material Record; Labor Record; Foundry Order; Material Purchased; Material Received; Pattern Dept. Time Slip; Machine Shop Time Slip; Machine Shop Operation Slip; Material Drawn Slip; Material Credit Slip; Store Ledger; Clock Record; Pay Roll; Stock Short; Stock Order; Total Cost; Cost Comparison.

Order Received: When an order is received, it is entered in the order book and given the next consecutive order number. The sales order, Fig. 1, is then made out; the original and a colored copy go to the superintendent's office, (head of operating department) and a carbon copy to the foreman of each of the other departments. He advises such foremen of the receipt of the order, and notifies them to arrange the affairs of their departments so that their part of the order will be ready when required. The *original* sales order, Fig. 1 remains in the superintendent's office for permanent record, the colored copy is returned to the general office upon the completion of the order, thus notifying the office to this effect. The required number of sales orders are made out on a typewriter in carbon.

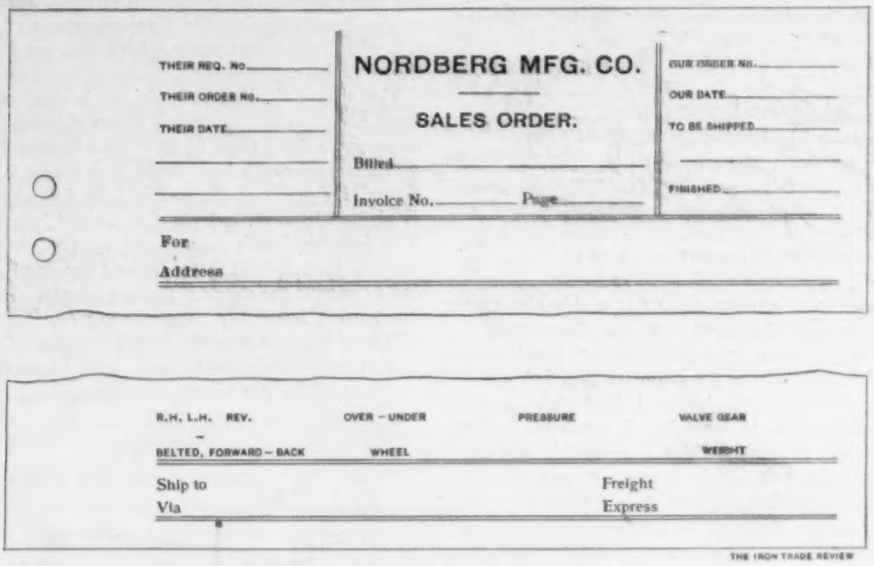


FIG. 1.—SALES ORDER.—ORIGINAL IS 6½ X 8 INCHES, WHITE.

Specifications are then prepared by the Engineering department as follows: One each for engineering and pattern departments on form, Fig. 2; one for operating department on form, Fig. 4 which is only one of a number of similarly printed sheets; and one for the general office. Specifications for standard work have names of different parts printed thereon as shown on Fig. 4.

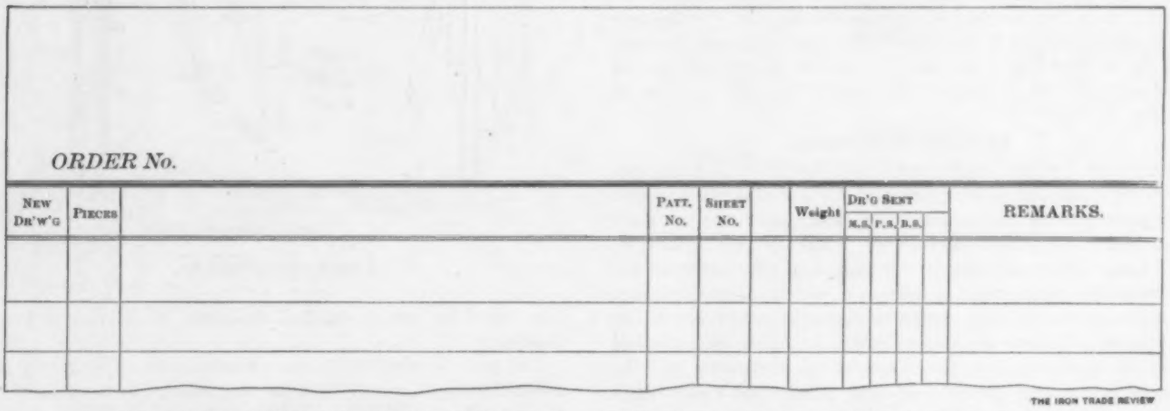


FIG. 2.—OVERTIME ROOM AND PATTERN DEPARTMENT. SPECIFICATIONS. ORIGINAL IS 8½ X 14 INCHES, WHITE.

The operating department and general office specifications show in detail every part required for the order, while the engineering and pattern department specifications are condensed, containing only those parts needed for making drawings and patterns.

The specifications are divided into sub-orders, that is, each complete part in itself which goes to make up the whole is given a sub-order number, using the original order number and a letter of the alphabet, thus, for the cylinder, 16232A, for the lagging, 16232B, etc., each complete part being designated by a letter and this same letter always applying to the same part. Material and labor are reported according to these numbers. A material record sheet is made out for each order where no specification has been prepared, and a labor record sheet form Fig. 6 for each order and sub-order. The material and labor record sheet is identical with Fig. 4 with the one exception, the "Article" column is left blank. Should any

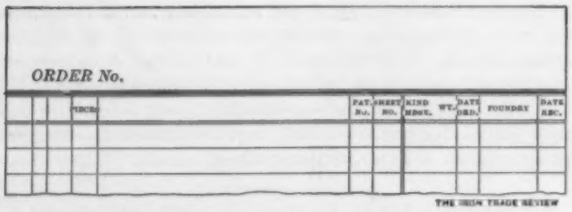


FIG. 3.—OPERATING DEPARTMENT. SPECIFICATIONS. ORIGINAL IS IS 8½ X 10 INCHES.

*Copyright, 1904, by E. A Bayerlein.

changes become necessary on a given order, all departments are notified by slip, Fig. 5.

Drawings, Patterns & Foundry Orders: The drawings having been prepared, work is commenced on the patterns.

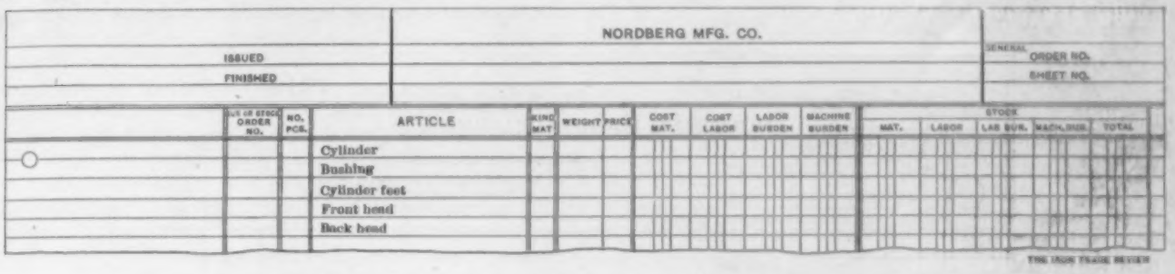


FIG. 4.—LIST OF SORTS. ORIGINAL IS 11 X 15 INCHES, WHITE.

New standard patterns are made under pattern numbers which run consecutively preceded by the letter P. Special patterns, or changes in existing patterns, are given an order number, or a proper sub-order number, as shown on the specifications.

Finished patterns are sent to the foundry, and a foundry order form, Fig. 7, is made out in triplicate, one copy going to

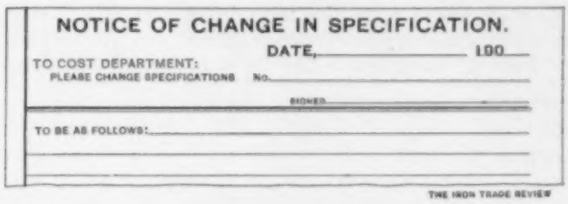


FIG. 5.—CHARGE OF SPECIFICATION. ORIGINAL IS 6 X 4¾ INCHES, WHITE.

the foundry, one to the receiving clerk and one remains on file. Triplicate bills without price are made out by Foundry clerk daily for all castings delivered to operating department, one copy remaining on file, one accompanies shipment and the other going to general office where same is priced and extensions made. Receiving clerk checks his copy with castings received and sends same to general office; if items agree, original is passed to credit of the foundry. These bills bear the order numbers and the items are posted for cost purposes direct to the proper specification or material order sheet.

Material is bought by purchasing agent, order form, Fig. 8, being used for this purpose. The receipt of material is reported by receiving clerk to the general office on form, Fig. 9, where same is checked against invoice.

Pattern and Machine Shops Time Slips: The pattern department time slip, Fig. 10, is a combination sheet for obtaining the time and material used in making a given pattern. In the machine shop two kinds of time slips are used. The time slip form, Fig. 11, is used in those departments where men perform many kinds of operations each day. These slips are handed in and are sent to the general office daily, and the time posted to the proper labor record sheet.

The operation slip, Fig. 12, is used in the machine department and wherever men are at work continuously on a given operation until same is finished. These slips are prepared by the foreman or his clerk, the time commenced and finished being punched thereon by an automatic time stamp.

In the machine shop men only put down the number of hours worked, while in the pattern department the men put down in addition to the number of hours worked, the amount of lumber, nails, screws, etc., used. When a given pattern or operation is finished, these slips are handed in by the men and are sent to the general office where the time is recorded on labor record sheets and the material shown on pattern slip on material record sheets.

Unproductive Labor: For the purpose of obtaining the amount of unproductive labor, standing numbers are used and in this case run from one to twenty. No. 1, being maintenance of machinery. No. 2, maintenance of tools, etc.

These orders are issued in superintendent's office, and pass through to the general office in same manner, as the production orders.

Material is drawn from the store room on material drawn order form, Fig. 13. The order being filled, it is recorded in Store Ledger, Fig. 15, and passes to superintendent's office daily, where items are checked on operating specification. After being checked, they pass to the general office where they are priced and material posted on proper specification or material record sheet. Should any material be returned to store room a credit slip form, Fig. 14, accompanies it, and passes through in same manner as the material drawn slip.

The form, Fig. 15, has been found very satisfactory for store room ledger.

Men are paid from the clock record, each man having a number and punching same on a day time recorder on coming into and leaving the works. Overtime is reported separately. The hours are recorded in time department on pay roll sheets, Fig. 16. Employes are paid semi-monthly on the 10th and 25th of each month by pay roll check.

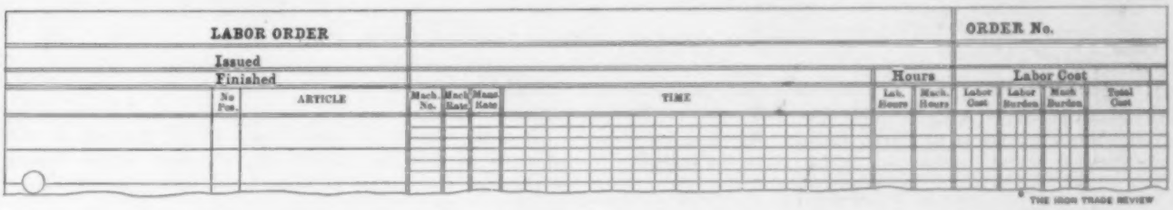


FIG. 6.—LABOR RECORD SHEET. ORIGINAL IS 12 X 13 INCHES, WHITE.

Stock Order and Stock Short: While the company only builds machinery on orders secured in advance, standard parts are manufactured and constantly kept on hand. If any parts are running low, the superintendent is notified by store keeper on form, Fig. 17.

Stock is manufactured only upon stock orders being issued,

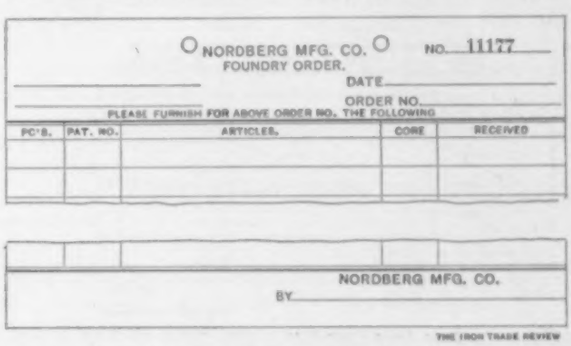


FIG. 7.—FOUNDRY ORDER. ORIGINAL IS 5½ X 7½ INCHES, BLUE.

Fig. 18. Here the numbers from 1 to 1,000 are used with the letters of the alphabet preceding them, thus M 262, etc. This order after being issued is sent to general office where material and labor record sheets are prepared; it is then returned to Superintendent's office and remains until order is finished when it is so marked and sent to general office.

Cost cards in card case are kept by cost clerk of sundry parts, cost of materials, etc., for handy reference.

Cost Comparison: A form is used for listing stock parts manufactured. This has columns for Order Number, Date, Size, Weight, Kind, Material, and Price. This enables the cost department to note any variations in the cost of production, also serves as a complete cost record of parts made.

All sheets are upon the loose leaf principle, and suitable binders are used throughout. Different colored slips are used for the different departments. This facilitates the sorting of the slips and enables the general office to easily recognize all department work.

All costs become by journal entries, at the end of each month, a part of the records of the general books, thereby proving the correctness of same when books are closed.

PURCHASING DEPARTMENT. Put this Number on your Invoice 7710

REQUISITION. NORDBERG MANUFACTURING CO.

To _____ MILWAUKEE, WIS., _____

MAIL IMMEDIATELY ON SHIPMENT INVOICE AND BILL OF LADING SHOWING WEIGHT AND THROUGH FREIGHT RATE.

Please furnish us the following material: Price

If you cannot fill order promptly notify us at once. NORDBERG MANUFACTURING CO.

SHIP VIA _____

PURCHASING AGENT.

THE IRON TRADE REVIEW

FIG. 8.—MATERIAL PURCHASED. ORIGINAL IS 5¾ X 9 INCHES, WHITE.

RECEIVING DEPT. CITY.

NORDBERG MFG. CO.

TO PURCHASING DEPT. DATE _____ 190____

PURCHASE ORDER NO. NO. RECEIVED FROM _____

VIA. _____ FRT. CHGS. _____

Receiving Clerk.

THE IRON TRADE REVIEW

FIG. 9.—MATERIAL RECEIVED. ORIGINAL IS 6 X 9½ INCHES, RED.

terial and labor record sheets, and the chief cost clerk summarizes such cost upon a form. This sheet has columns: Order Number, Pcs., Name of Parts, Weight, Material, Labor, Labor Burden, Mach. Burden; etc. This gives the complete cost of an entire order in a form handy for reference and in such manner that the cost of any complete part can be quickly ascertained. For cost of detail parts, reference can be had to the specification.

NORDBERG MFG. CO.

ORDER No.

COMMENCED | PRINT No.

FINISHED | JOB No.

NAME | MAN'S No.

PLEASE MAKE

Date	Hrs.	KIND OF MATERIAL	Quan. or Ft.	Pr.	COST MATERIAL	

FOREMAN

EMPLOYEE

THE IRON TRADE REVIEW

FIG. 10.—PATTERN SHOP TURN SLIP. ORIGINAL IS 4⅝ X 8½ INCHES, BLUE.

The T. H. Symington Co., of Baltimore, has purchased the Corning, N. Y., foundry of the American Brake Shoe Co. This plant was formerly known as the Corning Iron Works. The price paid for the plant was about $50,000. For nearly a year this plant has been manufacturing patent journal boxes for railroad cars under contract with the Symington Co. The Symington Co. is capitalized at $1,350,000, of which $350,000 is preferred and the remainder common.

MACHINE No. NORDBERG MFG. CO. MAN'S No.

Time of _____ for the _____ day of _____

ORDER NO.	OPERATION	No. PCS.	ARTICLE	HOURS

☞ Time and No's. must be filled in correctly or will not be allowed.

THE IRON TRADE REVIEW

FIG. 11.—MACHINE SHOP. ORIGINAL IS 5½ X 7½ INCHES, WHITE.

The Detroit Iron & Steel Co., Detroit, has issued $400,000 worth of bonds bearing 5 percent interest.

Cincinnati Machinery Market.

CINCINNATI, May 31.—The reports from manufacturers of machinery this month are not of as hopeful a tenor as those of a month ago. The falling off in orders which has taken place during May has not as yet affected the shops materially so far as their operations are concerned, and they are employing about the same number of operatives and running about the same hours as thirty days ago. But this activity is largely employed in the filling of old orders, and the amount of new business in sight does not give particularly good promise for the summer. In fact, it seems to be fairly well established that the trade is expecting a quiet business until fall. It is generally commented upon that, regardless of the real or imagined effects of a presidential year, this feature has its bearing on the situation, and the large industries as well as the smaller may be expected to exercise conservatism until commercial conditions present a brighter aspect. This general statement applies to all lines of machine tools, but it is noticeable that shapers and lathes are selling a shade better than other lines. In drills, radials are in rather better demand than uprights. The local manufacturers as a rule are maintaining prices, but they report finding considerable competition in the way of price inducements from other centers. The shops are enlarging their lines and many concerns have new features in the way of improvements and new tools under way. Considerable attention is being given to high-speed motor driven tools.

Some effort is being made to secure foreign business, and in the past week the trade has had the pleasure of a call from B. Schuette, of the firm of Schuchardt & Schuette, of Berlin, Germany. This firm is the foreign representative of several local manufacturers and in speaking of conditions abroad Mr. Schuette observes that the industrial conditions in Germany show a steady improvement. He observes that the German builders of machine tools are underselling American manufacturers on the ordinary and cheaper lines of tools, and that it is difficult for the American manufacturer to compete successfully with the German maker of machines on the heavier types of machine tools. It is only on the high grade machines with devices making for high efficiency and time saving that a market abroad can be expected in competition with foreign builders. He observes also that the motor-driven machines are gaining in popularity and that foreign manufacturers are giving this feature of machine tool operation careful attention.

The Lodge & Shipley Machine Tool Co. is running full time, and with a better force than at any time since Jan. 1. The company reports nothing new in conditions the past month. Gardeners are at work beautifying the grounds of this concern, as usual, and the flower beds are a great attraction in a survey of this large plant.

The John Steptoe Shaper Co. reports business active and has enough orders now in hand to run through July. New business is quite satisfactory.

Greaves, Klusman & Co. have been fortunate in securing a nice line of orders, and have enough work in hand to keep run-

NORDBERG MFG. CO.

DATE _____ 190__ ORDER NO. _____

COMMENCED _____ SET OF PRINTS NO. _____

FINISHED _____ SHEET NO. _____

NAME _____

NO. PCS. _____

PLEASE PERFORM OPERATION AS PUNCHED.

DAY MAN'S No.		DAY MAN'S TIME		NIGHT MAN'S TIME		NIGHT MAN'S No.	
MACHINE NO.		DAY	HOURS	DAY	HOURS	MACHINE NO.	
	Boring					Lagging	
	Babbitting					Laying out	
	Cutting off					Milling	
	Chipping					Planing	
	Case-harden					Patching	
	Covering					Polishing	
						Painting	
	Drilling					Pressing	
						Repairing	
	Erecting					Shoeing	
	Facing					Soldering	
	Forging					Shaping	
	Filing					Threading	
	Finishing					Tapping	
	Fitting up					Testing	
						Turning	
	Grinding						
						Boxing	
	Helping						
	Key Seating						

SIGNED _____

DAY MAN SIGNED _____ NIGHT MAN

THE IRON TRADE REVIEW

FIG. 12.—MACHINE SHOP. ORIGINAL IS 4½ X 9½ INCHES, WHITE.

NORDBERG MFG. CO.

TO STOREKEEPER:

Please Deliver to Bearer the Following and Charge above Order Number.

Order No. _____

Date, _____ 190__

Man's No. _____

Bin No.	Stock Order No.	PC'S.	ARTICLES	Weight.	Mat.	Lab.	L. Bo.	M. Bo.	Total.

Date Given Out _____ Signed _____ FOREMAN.

Recorded _____ STOREKEEPER. Recorded _____ COST CLERK.

THE IRON TRADE REVIEW

FIG. 13.—MATERIAL DRAWN SLIP. ORIGINAL IS 4½ X 8¾ INCHES, WHITE.

NORDBERG MFG. CO.

TO COST DEPARTMENT:

The Following Were Returned in Good Bad Order, Credit Above Order Number.

CREDIT NOTICE.

Order No. _____

Date, _____ 190__

Man's No. _____

Bin No.	Stock Order No.	PC'S.	ARTICLES	Weight.	Mat.	Lab.	L. Bo.	M. Bo.	Total.

Date Taken Out _____ Signed _____ FOREMAN.

Recorded _____ STOREKEEPER. Recorded _____ COST CLERK.

THE IRON TRADE REVIEW

FIG. 14.—CREDIT NOTICE. ORIGINAL IS 1½ X 8¾ INCHES, YELLOW.

ning until July 1. They are operating full time and full force.

The Cincinnati Milling Machine Co. is running full time, but notices some falling off in orders this month as compared with a month ago. The company is bringing out a new No. 5 heavy plain machine, also a No. 2 grinding machine for grinding large cutters. These two features are expected to afford a valuable addition to the company's line.

Schumacher & Boye are running about the same as in the past few months and have no particular complaint to make in regard to business.

The Cincinnati Planer Co. is running full time but finds business quiet, and the amount of new orders received the past month is rather small.

The American Tool Works Co. is running full time and practically full force and reports the best month in orders since October. Quite a number of orders are now on hand for the new American all gear head lathes for motor drives.

The Bickford Drill & Tool Co. has nothing to report out of the ordinary and is running full time and full force. The company has brought out another new type of radial drill called the semi-radial, designed particularly for structural boiler shops and work of that character.

The Queen City Machine Tool Co. finds business only fair. The shop is running full time with about the usual help. The company will bring out in the near future a 24-inch shaper with a line of attachments, which will be ready about July. The new shaper will probably have a motor drive.

The Bickford Drill & Tool Co. and the Cincinnati Milling Machine Co. have jointly arranged to send Fred Holz Jr. abroad, in company with Mr. Schuette, of Schuchardt & Schuette, to make an investigation as to the kind of machines it would pay best to make for the foreign trade. These two companies are having their literature translated into French and German.

STOCK SHORT

TO SUPERINTENDENT: DATE 190

PLEASE FURNISH THE FOLLOWING REQUIRED FOR

SIGNED STOCK KEEPER

THE IRON TRADE REVIEW

FIG. 17.—STOCK SHORT. ORIGINAL IS 6½ X 4½ INCHES, WHITE.

The McIlvaine & Spiegel Boiler Tank Co. has had an active month. Orders have been taken for a 600-h. p. boiler for the water works at East Liverpool and a 200-h. p. boiler for the water works at Newark, O. The company has also taken an order for a 400-h. p. boiler for the Union Distilling Co. of this city. A number of local plants are putting in new boilers, mostly in the way of enlarging the plants, and the company is very busy with repair work.

The Oesterlein Machine Co. is arranging to build a new plant on Spring Grove avenue, adjoining the plant of the Cincinnati Machine Tool Co. which is now in the course of construction. The present quarters of the company are under a leasehold which expires Jan. 1, and Mr. Oesterlein hopes to be able to get into his new plant by that time.

On Saturday evening, May 21, the local machine tool men tendered Mr. B. Schuette a dinner at the Cincinnati Zoological Garden Club House. An elaborate menu was served. Among those who enjoyed the occasion were: Philip O. Geier, C. Wood Walter, L. W. Anderson, Geo. Stewart, Dr. Otto P. Geier, Wm. Tuechter, G. A. Mayer, H. M. Norris, Harry Hoefinghoff, T. G. March, Fred Holz, Louis Keck, Aug. H. Tuechter and Walter Geier.

STORES RECORD NORDBERG MFG. CO. SHEET No.

NAME OF ARTICLE COMPARTMENT No

BIN No.

SHELF No.

	QUANTITY RECEIVED			TOTAL		QUANTITY DELIVERED					BALANCE		REQUIRED		ORDERED		Pur or Stock No.
	From	Date	Pcs.	Weight	Material	Stock	PCS.	WEIGHT	DATE	TO	ACCT OF	Material	Stock	Job	Amt.	Date	Amt.	

THE IRON TRADE REVIEW

FIG. 15.—STORES LEDGER. ORIGINAL IS 12½ X 15 INCHES, WHITE.

Work on the erection of the new structural shop of the Red Oak Bridge & Iron Works, Red Oak, Ia., is progressing rapidly. The main building is 46 x 100 feet, with a lean 16 feet wide running the entire length of the building.

The foundry of the Keagy & Lear Machine Co., Coshocton, O., was not damaged by the recent fire. The machine shop was partly burned, as were all the company's patterns and the belting in two buildings. The plant is running again in full. The company expects to rebuild, but has not made any definite plans.

NORDBERG MANUFACTURING CO.

TIME FOR { First / Last } HALF OF 190

FORM 59

	MAN'S No.	NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	BONUS	TOTAL HOURS	RATE PER HOUR	AMOUNT PAID	INS. DEPT		REMARKS
		Amount Forwarded																																						

THE IRON TRADE REVIEW

FIG. 16.—PAY ROLL. ORIGINAL IS 12 X 14 INCHES, WHITE.

The blast furnace of the Detroit Iron & Steel Co., on Zug Island, recently made its best record, producing 298 tons of iron in 24 hours.

STOCK ORDER

ENTD. NO.

TIME DEPT.

COST DEPT.

DATE 190

No. Pcs.		Kind Mat.	Weight	Memo.

FINISHED 190

SENT TO GENERAL OFFICE 190

THE IRON TRADE REVIEW

FIG. 18.—STOCK ORDER. ORIGINAL IS 6¼ X 10¾ INCHES, YELLOW.

The National Gear Co., Ravenna, O., made an assignment last week. The assets are said to amount to about $10,000.

The Universal Exposition.

(Editorial Correspondence.)

ST. LOUIS, May 30.—The photoscope is among the mechanical features of special interest from the popular point of view. It is one of the very latest forms of the nickel-in-the-slot machines and has the peculiar property of turning out

FIG. 1.—THE PHOTOSCOPE.

a photograph in response to the insertion of the coin and pressure on the button. The exhibit of kodakery of this advanced type is about as much of an enigma to the mechanic as to the rest of the spectators. The whole thing is covered over with a neat wooden case and one can see little of the mechanism which turns nickels into photographs. The whole thing was reminiscent, however, of a machine for a similar purpose which but a few years ago was under consideration in Cleveland, and on inquiry I learn that it is the perfected form of that early picture-taking device.

The contrivance is illustrated in Fig. 1. The machine stands on the pedestal seen in the center of the engraving and the working parts are protected by the cover shown at the left. In the center of the front of the case is a mirror and there is a hole in the middle of the latter. The stool is placed at the precise distance to bring the sitter in exact focus and—the machine does the rest. A convenient slot receives the coin and then the person in line for a photograph takes the push button (seen hanging on the hook at the right hand corner of the machine) and sits in position on the stool. The latter is adjusted until the head of the sitter is in the center of the mirror and then the button is pressed. The little machinery that is in sight at the top of the machine is at once in motion and after a few seconds a bell strikes, indicating the conclusion of the exposure, and in less than a minute a photograph about an inch in diameter and enclosed in a neat metal frame rolls out into the semicirclar pocketat the front of the contrivance and all is over.

Taking photographs by machinery is something of an undertaking. It comes within measurable distance of a mechanical exploit involving rare skill, and will be interesting and wonderful to the great number of mechanics more or less familiar with photography. It is all the more surprising to see a machine turn out photographs with the regularity of screw machine practice when one is aware of the essential steps in picture production by camera, etc. The line drawing in Fig. 2 will best show the manner in which these astonishing results are obtained. The motive power is obtained from nine cells of battery, six of these operating the small electric motor and the other three energizing an electro-magnet which works the shutter of the lens. The machine is so arranged that it may be operated from an electric lighting circuit, and as the source of illuminating is a five-ampere lamp for interior work with the photoscope the one circuit may be utilized for the entire series of light, power and shutter-tripping machanism.

The sensitized films with their protecting covering of metal come in tubes about a foot long. Such a tube is shown at A in Fig. 2. This is of course wrapped with paper and the two ends protected from the light with pasteboard discs. The charged tubes after the discs and paper have been removed, is inserted through a hole in the top of the case and pushed down securely into a socket. Then a wooden punch is pressed in it at the top of the tube to force out the plug at the bottom and down over the top of the tube receiver, leaving a space for the rotation of a feed disc which carries the plates separately around to the slot on their way to a position before the lens for exposure. The stool is placed directly in front of the machine and some four feet from the case. The coin slide B receives the nickel and when all the plates are removed from the tube A a lever C is forced upward, pressing the bottom plug back into the tube which may then be removed and a fresh one be put in. The dropped nickel in the slot establishes an electric contact at D and all is then in readiness for the push button. On pressing the latter the magnet and switch E are energized and the motor puts the rest of the machinery in operation. The machine continues in operation until the electric connection is broken by a traveler, when all the operations are concluded in the exposure, development and delivery of the photographic plate. When the button is pressed, the magnet-operated shutter E is released and rotates by gravitation bringing a friction wheel in contact with a disc at F and this rotates the shutter until the requisite exposure has been made. When the

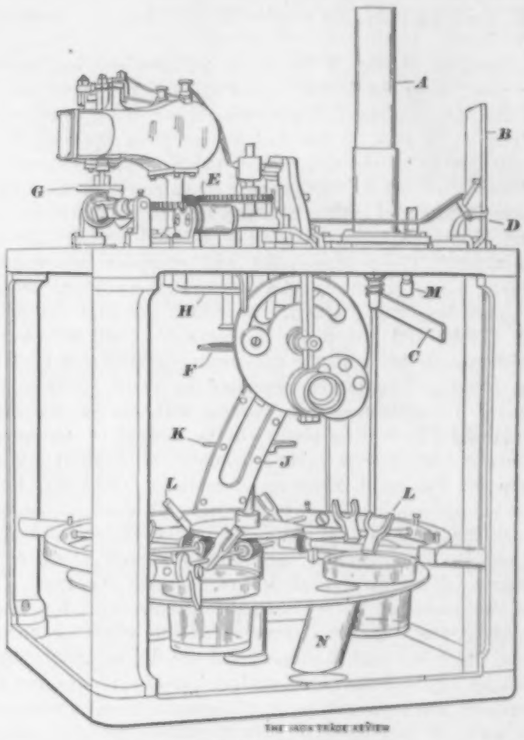


FIG. 2.—DETAILS OF PHOTOSCOPE.

opening in the shutter passes the lens, completing the exposure period, electric contact is made with a bell, relieving the sitter of any further struggle at being "pleasant." The time for the exposure can be varied according to the light conditions by changing the speed of the motor. This is accomplished as follows: Power is transmitted from motor to the friction disc G to a leather wheel on the governor

shaft. The relation of the friction wheels can be adjusted by moving the motor which rests upon a supporting stem and this in turn may be swung from side to side to increase or decrease the speed of the machine by means of a lever H.

The plates fall from the tube into the disc and are carried around to an opening above the chute J and then fall by gravitation behind the lens. After the exposure, a plate drops down the chute until stopped by a finder operated by a seven-pointed cam. Below the chute is the first of a series of seven cups containing the developing, toning and fixing solutions. The central shaft supporting the cam or star K also drives seven fingers which dip into the cups. These fingers turn in the solutions and at each rotation scoop up a plate and tip it over the edge into the next cup and finally drop it through the exit L into the receiving tray or pocket on the front of the machine. The purpose of the seven-point star or cam on the central shaft is, as will be seen, a check against more than one plate being in a cup at the same time. It thus preserves the mechanical succession of operations with due regard to the capacity of the photographic equipment. The cups for the solutions are fluted internally so that the plates drop in exact position for the appropriate action of the fingers of the machine and are thus lifted with certainty according to the time requirements of the solutions. The cups are placed in a frame which may be rotated for refilling purposes and in the event of the fingers being in the way, a switch at M will run the forks around until the cups are free. The exposure is usually about four seconds and the total time for the production of the picture from start to finish is within a minute from the time of pressing the button. The photoscope is the working exhibit of the American Automatic Photograph Co. of Cleveland.

EXPOSITION NOTES.

The American Well Works, of Aurora, Ill., have two exhibits at St. Louis. In the Machinery building, block 35, the company shows its air compressors, steam pumping and well drilling machinery, and in the Mines and Metallurgy building, block 13, it has an exhibit of its coring and prospecting machinery.

The C. O. Bartlett & Snow Co., of Cleveland, has received an order from the United States Geological Survey for one of its No. 3 style C four-compartment direct heat rotary dryers to be used in the coal testing plant operated at the exposition under the direction of the Survey. The tests will be conducted not for the purpose of determining the relative value or merit of different coals, but primarily for the purpose of demonstrating the most economical methods for their utilization. The testing plant will comprise two standard boilers, a gas producer, coke ovens, washery plant, and two or more briquetting plants. In connection with the boilers one Corliss and one steam turbine engine will be operated, and in connection with the gas-producing plant one explosive gas engine. The power generated by these plants will be utilized for operating the working exhibits in the Mines Building. The testing plant will be located on the ground reserved for outdoor mining exhibits, at a short distance from the Palace of Mines and Metallurgy. The director of the Survey has appointed to conduct this work a committee consisting of Messrs. E. W. Parker, J. A. Holmes and M. R. Campbell. Congress has appropriated $60,000 to enable the director of the Geological Survey to make the tests. Care will be exercised to see that the samples sent for testing represent the commercial product of the mines or districts from which the coal is shipped and are not selected samples. No tests will be made of any coals shipped in less quantity than one good sized carload, as it will require from 8 to 20 tons for each of the different tests to which the coals will be subjected. Tests will be made also of the lignites of North Dakota, Utah, Colorado, New Mexico and Texas.

Wm. Johnson & Sons, Ltd., of Leeds, Eng., will exhibit a complete briquette plant in full operation in connection with the exposition. The process is intended to illustrate the possibility of utilizing the Western bituminous, semi-anthracite and lignite products of which from 30 to 50 percent is ordinarily worthless.

The Watt Mining Car Wheel Co., of Barnesville, O., announces the completion of its exhibit in the Mines and Metallurgy building, section 62, corner of aisles F and 4. Stationery is provided for vistors and mail may be addressed in care of the company.

The De Laval Steam Turbine Co., of Trenton, N. J., has a building in the Mining Gulch in connection with the outside mines and metallurgical exhibits. This is a working exhibit of high pressure and low pressure centrifugal pumps, direct connected to De Laval steam turbines, and electric motors. Besides this, the firm has a 300-h. p. steam turbine dynamo and 12-h. p. electro-motor pump with the Bullock Electric Mfg. Co.'s exhibit in the Electricity and Machinery building; and a steam turbine blower in connection with the Western Gas Construction Co.'s exhibit in the Manufactures building.

The Hancock Inspirator Co., the Hayden & Derby Mfg. Co., the Consolidated Safety Valve Co., and the Ashchoft Mfg. Co., call attention to their headquarters at Block 10, Machinery Hall.

CONCENTRATION OF WESTERN MESABI ORES.

The Canisteo Mining Co., in which Messrs. Congdon & Hartley, of Duluth, are largely interested, is employing 200 men and is exploring the lean ore belt through township 56-24. Messrs. Congdon & Hartley have been at work there three or four years, in experiments west of township 57-23, to and beyond the Mississippi. They came early to the conclusion that in 56-24 were the best opportunities and they have concentrated their efforts there. The Canisteo Mining Co. was formed by them last winter and it has under lease or option about 125,000,000 tons of ore, of which 20 percent is merchantable and the rest must be concentrated by net screening to a product estimated at about 75,000,000 tons. It was expected that all ore found would require concentration and the explorations were started with that idea in view.

This Western Mesabi ore, as is known, is generally a hard ore in thin strata, interlaid with sand. Of this sand some portions of the township show it as fine as flour, others coarse as sharp beach sand. It is in cases incrusted in the ore, but generally can be shaken loose more or less easily. Concentration by screening in a tilted barrel will be the method adopted, and it is expected that units large enough to care for the full product of a large mine can easily be installed and that the cost of concentration will not be above 5 cents a ton. The screened product will cost rather heavily for mining, as it is expected that about 120 percent of a ton must be hoisted and treated to get a ton of ore. The ore will be a hard good ore, largely Bessemer, free from dust and unusually dry. Experiments at Arcturus mine by the Standard Mining Co. showed an average moisture of 3 percent, against about 11 percent average Mesabi.

The Canisteo company is sinking a 3-compartment shaft on section 30 to a depth of 200 feet and another 300 feet deep on section 21. It has an ore body at 30 more than a mile long. These two ore deposits will be drifted in and the various qualities of ore will be tested in concentrating plants now going up. The company has 1,600 acres in this vicinity, only a part of which has been explored. It has spent as high as $30,000 on a single 40-acre tract and has quite full information. Its work is of the highest importance to the ore mining and steel making fraternity.

In addition to this company the United States Steel Corporation is at work in the same district on a concentrating proposition. It has an option for lease on the Arcturus mine and has drills there. This property is that at which initial experiments in concentration were made by the Standard Mining Co. The Corporation also has the Diamond mine and adjoining lands.

The court has extended the receivership of Robt. E. Jennings for the Carpenter Steel Works to Nov. 1. The receiver has made sales $45,000 in excess of scheduled price of assets in original inventory.

The Buffalo Union Furnace Co. has secured judgment against the receiver of the New York Car Wheel Works for $21,342.73.

The Eastern Machinery Market.

OFFICE OF *The Iron Trade Review*.
ROOM 1315, No. 150 NASSAU ST., May 31.

From the assurances given by representatives of all branches of the machinery trade, May apparently can be put down as the dullest month of the present year. Here and there a machinery house is found which says that its business for the month was a little more active than April, but the number of contrary reports more than makes up a majority. For such orders as presented themselves there was the keenest competition. In the matter of inquiries the month admits of a cheerful report, a very large number having been made, but when it came to closing, the general report is that more delay and difficulty were in evidence than could be noted so far this year. Manufacturers said this was because of a tendency to wait to ascertain if the condition of general business improved, and frankly admitted that unless something like this occurs, the machinery business is not going to be an exception to the general depression through which all lines of trade and manufacture are now passing.

With the difficulty of getting business has come a tendency to shade prices. This is particularly true of small electrical equipment, ruling prices of which are now 5 to 10 percent lower than those which prevailed a month ago. We state this on the authority of a representative house in the trade, which asserts that it was the larger companies that started the cutting owing to their determination to unload the large amount of surplus small equipment they had on hand, and that the smaller companies were forced to either follow suit or lose trade. Lower prices are being quoted for engines and boilers also, but not to any marked extent. In machine tools prices are being generally as well sustained as at any time during the past few years. For this the recent action of the National Machine Tool Builders' Association in holding to existing schedules is mainly responsible, though all manufacturers are not in that association. Another reason is that manufacturers are firm in the belief that unsatisfactory conditions in their line are not at all in consequence of prices, and therefore nothing that would be done with prices would help matters along.

In machine tools the month was without any development of interest, outside of the large orders taken by Manning, Maxwell & Moore, aggregating several hundred thousands of dollars, the major portion of which was from the Southern Pacific railway, for all kinds of tools to be installed in several of the company's shops. With most machine tool houses the month was only fair at the best, with orders for one or two tools at a time the rule. While there is a large amount of business in sight, machine tool men do not expect much of it to develop before the early fall. This view is taken of railroad propositions especially, it being argued that reductions of working forces already made by the railroads and those that are likely to be made do not hold out much hope for machine tool men so far as orders are concerned until general business improves, which is not expected to be the case until after the summer months at the earliest.

Engine and boiler men said that business with them during May, was not as satisfactory as for March and April. The falling off in demand was most noticeable in manufacturing lines. Much is heard of manufacturers who a month or two ago intended to purchase power equipment, but who because of disappointment in their respective lines have decided not to do so for the time being. Orders of this kind in abeyance are of considerable volume.

Electrical manufacturers not only report fewer orders in May but a falling off in inquiries. They charge both of these conditions to the disturbed state of labor in the building industry in a large measure, but aver that the depression in general business is a factor also. Reports are frequently heard of electrical manufacturers either laying off hands or making reductions in their salary lists. The latest action in this respect was by the Crocker-Wheeler Co., which, a few days ago, ordered a 10 percent reduction in salaries of all its employes from the president down. An official of the company stated that its New York office was the only one booking orders in any number, and that its other offices were finding business very slow. In power and transmission machinery the month was fairly active. This is also true of machinists', contractors' and engineers' supplies.

The matter of the machinery that will be required for the construction of the Pennsylvania tunnel is fast reaching the stage where orders are likely. At the offices of the O'Rourke Engineering Co. and Carr Bros., with whom machinery men are dealing, it was said that the specifications are almost in shape for presentation to the trade. The O'Rourke company said that it is now closing everything in the way of iron that will be required, after which the machinery items will be taken up. It is expected this will be in a very short time. Carr Bros. expect they will take up the purchase of machinery in a week or ten days.

The export machinery trade for the month brought forth no special activity. Only a moderate number of orders was booked. In machine tools the feature has been the number of orders that Cincinnati manufacturers have taken.

The Niles-Bement-Pond Co. found May a fairly good month. It did not book any contracts of magnitude, but small orders made up a satisfactory monthly total. The company reports a large amount of business in sight, but cannot tell when it will be closed. It expects that the closing months of the year will witness quite a revival in trade.

The Prentiss Tool & Supply Co. did a fairly good business in May, and thinks the machinery trade as a whole is marked by as many favorable conditions as any other line; that it will be the first to respond to any change for the better in the manufacturing situation.

The Crocker-Wheeler Co.'s New York office found trade exceptionally good during the past month, taking a larger number of orders, especially for small motors, than for any month of the present year. Contracts of note booked were as follows: One 200-k. w. engine type generator, from the J. B. Williams Co., Glastonbury, Conn.; complete electrical equipment, numbering among other things 44 motors, aggregating about 300 h. p., from a marble company, Ravenswood, L. I.; one 100-k. w. generator, and two 50-h. p. motors, from the New Haven Clock Co., New Haven, Conn.; four motors, aggregating 75 h. p., from the Stromberg-Carlson Co., Rochester, N. Y.; one 50-h. p. motor, from Mt. Vernon, N. Y.; one 50-k. w. generator, and one 10-h. p. motor, from the State Board of Education, Trenton, N. J.; one 40-k. w. generator from the Capewell Horse Nail Co., Hartford, Conn.; and three printing press equipments from the Government Printing Office, Manila, P. I.

The J. R. Van Dyck Co. reports its May trade of an ordinary character. The Philadelphia house booked some good machine tool orders from the Pennsylvania railroad.

The Ingersoll-Sergeant Drill Co. reports that business in May was satisfactory, orders for pneumatic tools being particularly good.

Thayer & Co., Inc., said that the steam boiler trade shows no change, current orders being confined to small units. They look for an awakening in business in the fall.

The Hooven, Owens & Rentschler Co. reports that trade in engines is on a normal basis. The company finds inquiries to be keeping up very well, but notes a little more reluctance than usual to close.

Schuchardt & Schuette, of Berlin, are sending the Perkins Machine Co., of Warren, Mass., a large number of orders. The Perkins Machine Co. recently shipped ten machines to different parts of Germany.

The Shaw Electric Crane Co., of Muskegon, Mich., with sales offices at 85-87-98 Liberty street, New York, has been awarded the contract for three cranes for the Locomotive & Machine Co., of Montreal, Ltd., for the new locomotive works this company recently erected, one of the cranes to be equipped with an auxiliary hoist. The same company has the crane order for the new shops of the Southern railway at Spencer, N. C.

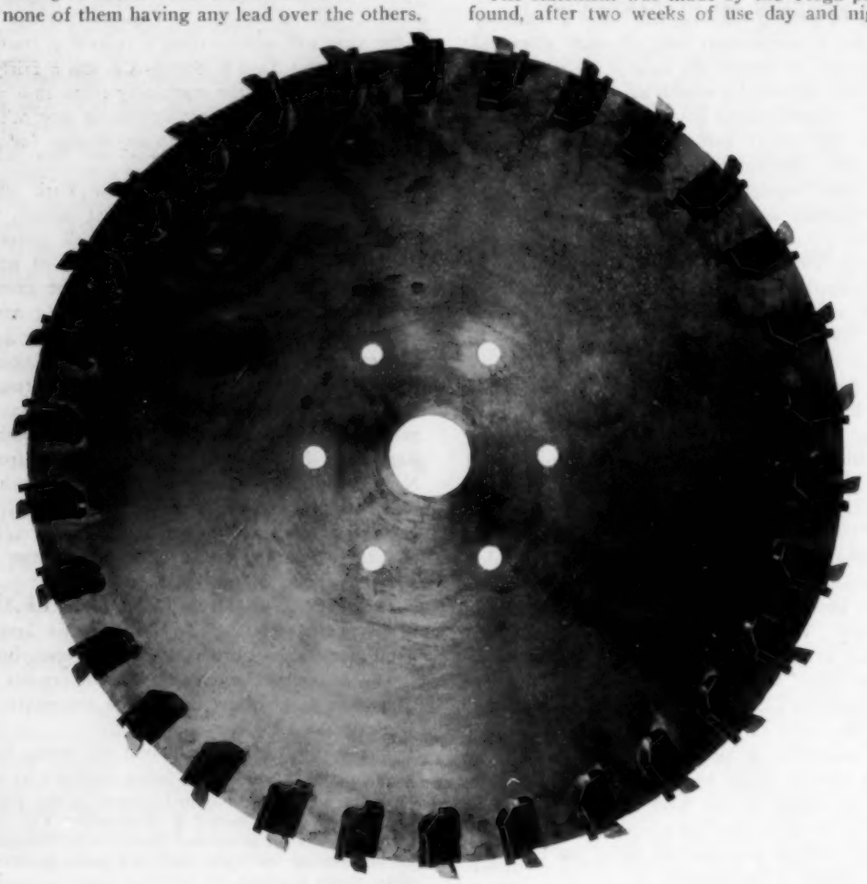
Manning, Maxwell & Moore's contract for the tools and machinery for the railway shops of the Southern Pacific Co. and its branch lines, includes equipment for shops at the following points: The new shop at Reno, Nev., and additions to the shops at Sacramento, Cal.; San Francisco, Cal.; Newark, Cal.; San Luis Obispo, Cal.; Los Angeles, Cal.; Oakland, Cal.; Colton, Cal.; Dunsmuir, Cal.; Fresno, Cal.; Bakersfield, Cal.; Mojave, Cal.; Ogden, Utah; El Paso, Texas; Algiers, La.; Houston, Texas; Guaymas, Mexico; and Tucson, Ariz. The order consists of tools for machine shops, boiler shops, locomotive and car shops, and is undoubtedly the largest single machine tool order that has been placed in this country in many years. The tools are all of late designs and many of them are being equipped with electric motors.

THE TAYLOR-NEWBOLD SAW.

An exhibition of the Taylor-Newbold saw, with inserted cutters treated by the Taylor-White process, as employed in regular work at the shops of the Tioga Steel & Iron Co., in Philadelphia, was given on Wednesday, May 25. The general appearance of the saw is shown in the illustration. The cutters of air-hardening steel, treated under exclusive rights for saws under the Taylor-White process, are held in U-shaped holders, inserted in the slots on the edge of the saw. These holders carry a hexagon headed set screw by which the depth of the cutter is nicely adjusted.

The curved top of the base casting in the saw gauge is a counterpart of the edge of the saw, and the slot in this casting a counterpart of the slot in the saw, so that when a holder is inserted, and the sliding upper portion is set over the curved edge of the gauge, the point of the cutter is brought to a uniform height by adjustment of the set screw in the bottom of the holder.

The saw which was shown in operation is 36 inches in diameter and carries 30 cutters. These cutters are all set to the same height, none of them having any lead over the others.



THE TAYLOR-NEWBOLD SAW.

but alternate cutters are wide and take the full width of the kerf, while others take out the center, the cut being always central, and the pressure of the cut balanced so far as the cutters and the blade are concerned. When the exhibition cut was started, the saw had been in continuous service cutting from .20 to .45 carbon steel for 130 hours without grinding.

The first piece cut was a .35 carbon forging 9 x 16 inches, into which the saw was fed so that it was cutting the full width of 16 inches in passing through. This section was cut through in 17 minutes, and entirely off in 20; and the operation would have been complete in 15 minutes had it not been for the slipping of a slack line belt. The cutting speed of the saw was 90 feet per minute, and the chips from the work were perfectly blue. The cut when finished was as flat and true as if made in a lathe. The width of the kerf taken out by the saw was 5/8 inch, while, the thickness of the saw blade being 7-16 inch, ample clearance was afforded for any possible springing in as the cut advanced. In sawing forged cranks, the forging always closes somewhat at the entering edge, and the pinching of the saw adds very materially to the power required to drive it. In this saw, not only is there no pinching of the saw blade, but the removal of two wide cutters gives a clear space of 14 inches, in which the saw may be backed out of the cut without wedging it open, and in other ways losing time. The ordinary saws with the teeth cut in the blade are rarely circular when ground, as the grinding wheel wears while spacing around the disc, so that at the beginning of its grinding the saw is smaller than where it finishes, with the result that very few, if any, old style saws cut uniformly all around their periphery. Moreover, the grinding of such a saw occupies from three to four hours. The 30 cutters in a 36-inch Taylor-Newbold saw can be changed in 15 minutes, which operation accomplishes the same thing as regrinding the old style blade. Three sets of cutters are usually furnished with each saw, so that the blade may never be out of service more than the time required to drive out the wedges and remove the old holders with their cutters, insert the new holders and cutters, and drive the wedges tight again. Should a single cutter break or lose its edge through accident, this individual cutter is removed instantly and replaced.

The statement was made by the Tioga people that they had found, after two weeks of use day and night of the Taylor-Newbold saw, that there was an increase in actual cutting capacity of from 800 to 1,000 percent or eight to ten times.

Nine crank forgings, in which the cuts were 5 inches thick and 5½ inches deep, were sawn out complete, actual machine time, 80 minutes—the total time, including the handling of the forgings on and off the machine, being exactly two hours and twenty-five minutes. With the old saw, the time would have been about twelve hours, and the saw would then have been unfit for further use. It will be observed that the gripping of the holder in the blade is accomplished by the driving of a wedge, and is not dependent upon a driving fit in the blade itself. It will be seen that the holder intervenes between the hard cutting tool and the saw blade, so that, in case of an accident, such as slipping of the work, or something fouling a cutter, and so throwing unusual stress upon it, the holder, which is made of softer material, acts as a fender to save the blade.

Chips were shown cut from 12-inch slabs of 1.88 carbon steel by 84-inch Taylor-Newbold saws. Some of these chips welded together by their own heat after leaving the saw cutter. The 84-inch saw was advancing through a 12-inch slab at the rate of 40 inches an hour when these chips were taken.

The Taylor Newbold saws are manufactured by the Tabor Mfg. Co., of Philadelphia, under exclusive rights to the Taylor-White process for the cutters.

The Semi-Centennial of the Thomas Iron Company.

Fifty years have passed since the Thomas Iron Co., the famous Lehigh Valley producer of pig iron, was organized in 1854, at Mrs. White's tavern in Centre Square, Easton, Pa. Wednesday, June 1, was set apart for the commemoration of the anniversary and a dinner to the stockholders was given at Hokendauqua, Pa., with other features, including an excursion over the company's Ironton railroad to one of its ore properties. A more permanent commemoration of this important event in the history of the iron industry in the United States was the preparation of a splendid souvenir volume, giving in detail the history of the Thomas Iron Co., illustrating and describing its properties and graphically portraying its evolution into the far-famed corporation of today. The souvenir, with its photographic reproductions of the plants that have made such noteworthy records, its portraits of the founders of the Thomas Iron Co. and its intensely interesting narrative —a veritable romance of American iron-making—is one of the most noteworthy volumes yet published dealing with the development of the country's most conspicuous industry.

The valley of the Lehigh is one of the garden spots of the United States, and the early owners of its fine farms won from the soil the money that later was available for industry, when the abundance of ores, the availability of anthracite coal for smelting and the proximity of flux suggested that iron-making had its place alongside the tilling of the soil as a native industry.

The Beginnings.

The souvenir book prepared for distribution among the stockholders of the Thomas Iron Co. at this week's celebration was written by B. F. Fackenthal Jr., president of the company, and is admirable in the writer's conception of what history is and how it should be presented. The beginnings of the Thomas Iron Co. have been recorded in a fragmentary way in papers for historical and engineering societies, but never with the completeness of the present volume. The views of ore mines, railroads, blast furnace properties, superintendents' and workmen's houses, and the portraits of all but one of the 25 founders of the company are features full of interest, and the accompanying story is doubly so.

The Thomas Iron Co. was named after David Thomas, who has been called the father of the anthracite iron industry in America. Though some anthracite iron had been made in the United States before he settled in Pennsylvania, he was the first to make a success of anthracite practice. He was actively engaged in the management of the Crane Iron Works at Catasauqua, Pa., when the Thomas Iron Co. was formed and was a leading promotor of the latter, negotiating for the site and advising as to other matters, but was not an officer until 1880, when he became a director.

Samuel Thomas, the only one of the founders of the Thomas Iron Co. now living, is the son of David Thomas, and was appointed superintendent of the company on its organization, being entrusted with the construction and management of the works. He became president of the company in 1864 and resigned the office in 1887 to carry out a long cherished plan of establishing iron works in Alabama. He is still, however, a member of the board of directors.

The capital subscribed by the original 26 stockholders was $200,000. The Thomas Butz farm about a mile above Catasauqua, Pa., containing 185 acres 90 perches, was bought for $37,112.50. The town of which this was the site was at first called Coplay, but afterward Hokendauqua. Two blast furnaces were constructed at first. The boilers cost $9,353, and the two beam blowing engines $42,600. The engines had steam cylinders 56 inches diameter and blowing cylinders 84 inches diameter by 9 feet stroke.

Properties of the Company.

At the close of 50 years the Thomas Iron Co. has nine active stacks, four at Hokendauqua, two Lock Ridge furnaces at Alburtis, one Keystone furnace at Island Park, and two Saucon furnaces at Hellertown. The total annual capacity is 260,000 tons of pig iron.

No. 1 furnace at Hokendauqua was first put in blast on June 1, 1855; No. 2 furnace on Oct. 23 of the same year. Both were 60 feet high, 18 feet diameter at the bosh and 8 feet tunnel-head. Their combined output was upwards of 20,000 tons a year. Henry's "History of the Lehigh Valley," published in 1860, gave the largest output of the two furnaces in one week as 605 tons and the largest week's output for one furnace 351 tons. No. 1 furnace today is 17 ft. by 80 ft. No. 2 furnace has been abandoned, as has No. 4, built in 1863. No. 3 is 17 ft. by 80 ft. and Nos. 5 and 6, 17 ft. by 60 ft.

The Lock Ridge Iron Co. was chartered Dec. 26, 1866, and the entire capital stock was taken by the Thomas Iron Co. May 1, 1868. The property contains 170 acres, and in addition to the two furnaces—14 ft. by 60 ft. and 16 ft. by 60 ft.—there are limonite ore lands and dolomite quarries.

Keystone furnace is 2½ miles from Easton, Pa. It was purchased in 1882 from D. Runkle & Co. It is now 16 ft. by 65 ft. The property consists of 61 acres. Brown hematite ore is supplied from Williams township mines. This is the only furnace remaining in the Lehigh Valley between Easton and Bethlehem, 10 other stacks belonging to four other companies having been abandoned.

B. F. FACKENTHAL, JR., PRESIDENT THOMAS IRON CO.

The two Saucon furnaces at Hellertown—16 ft. by 75 ft. and 16 ft. by 60 ft.—were purchased by the Thomas Iron Co. in 1884. The property contains 73 acres. There is valuable limonite ore within hauling distance. Most of the ore is high in manganese, making this location especially desirable for the manufacture of basic pig iron. The flux is dolomite from quarries near by. The company owns the Saucon Valley Iron & Railroad Co. which connects with the Philadelphia & Reading near Bingen and runs from there to the zinc mines at Friedensville.

The Wawayanda property, in Passaic and Sussex counties, New Jersey, was purchased by the Thomas Iron Co. in 1870. It contains 5,902½ acres, in addition to mineral rights on 493 acres. The property was purchased on account of its known deposits of iron ore.

The Richard mine is the most important and valuable of all mines owned by the company. It is in Morris county, N. J., 2½ miles north of Dover and 1½ miles north of Wharton (formerly Port Oram), N. J. It is part of the old Mount Hope tract. The company's holdings consist of 83 acres at an original cost for land of $32,360. In 1867 the Thomas Iron Co. joined with other mine owners in the Mt. Hope district in building the Mt. Hope mineral railroad which reaches the Richard mine. The total output of the Richard mine since its purchase by the company in 1856 has been 2,212,838 tons. The ore is magnetic, of high grade. The average analysis for the past 12 years, representing shipments of over 1,000,000 tons, was 60.19 percent metallic iron. The

highest average was 61.89 percent and the lowest 58.54 percent. The phosphorus averages about .75 percent, silica 6 percent, and alumina 3 percent.

For two years after the starting of the Hokendauqua furnaces all ore from nearby Lehigh Valley hills was carted to the furnaces by team, but in 1856 the Thomas Iron Co. joined with the Crane Iron Co. in building the Catasauqua & Fogelsville railroad. The road was opened to Rupps station in 1857 and later extended to the mountain at Rittenhouse Gap to reach the magnetic ore mines at that place. The road is also the connecting link between Alburtis and Hokendauqua furnaces. The Thomas Iron Co. now owns 40 percent of the stock; the balance is owned by the Philadelphia & Reading Railway Co. The Hokendauqua works are connected with the Philadelphia & Reading, Lehigh Valley and New Jersey Central roads.

The Ironton railroad was chartered in 1859 to connect with the Lehigh Valley road at Coplay. It is owned entirely by the Thomas Iron Co. and extends to its brown hematite ore mines at Ironton and to its limestone quarries.

Personnel.

Reference has been made above to the official connection with the company of Samuel Thomas, the only one of the founders now living. His brother, John Thomas, was appointed superintendent July 1, 1857. He resigned March 1, 1893, and died March 19, 1897. The present general superintendent, David H. Thomas, son of John Thomas, immediately succeeded his father and has been employed by the company for 25 years and 10 months. He entered the machine shop at Hokendauqua in 1875; in 1880 was appointed superintendent at Lock Ridge furnaces; resigned in 1885 to manage a plant in Alabama; became superintendent of the Troy Steel & Iron Co.'s furnaces on Breaker Island, N. Y., and in 1888 reentered the employ of the Thomas Iron Co.

B. F. Fackenthal Jr., president of the company today, was elected director and president in 1893 and thus has been at the head of the company for eleven years. James W. Weaver was elected secretary and treasurer in 1893 and is still in office. The vice president is Wm. H. Hulick. The directors are Samuel Thomas, B. F. Fackenthal Jr., Wm. H. Hulick, Fred R. Drake, W. P. Hardenbergh, J. Samuel Krause, J. W. S. Rodenbough.

Frank S. Hartman, the present cashier, entered the company's employ in 1864 and has thus been connected with it for over 39 years. Nine other employes in responsible positions, including two mine superintendents, have been with the company for long terms, these ranging from 17 to 25 years.

Joseph McFetridge finished 50 years in the company's employ on April 18, 1904. He was the engineer who hoisted the stone for building Furnace No. 1. In 1856, when the company put in service its first locomotive, "Hokendauqua," he became its engineer and filled the position many years. He is still active at the age of 70 and has the position of storekeeper. Eighty-five employes—mechanics, furnacemen and laborers—have been with the company 20 years or more, eight of them for more than 40 years and 31 for more than 30 years.

The above details are gleaned from Mr. Fackenthal's Souvenir History. The following interesting data are taken from the same source in their original form:

Contrast of Early and Latter-Day Conditions.

"Percy's Metallurgy," pages 380 to 385, published at London, in 1864, selected the Thomas Iron Co.'s furnaces at Hokendauqua as "standing pre-eminent" in illustrating the furnaces of America. In speaking of the manufacture of iron with anthracite coal, the author says:

"But the principal manufacture must always cling to the Lehigh, Schuylkill and Lower Susquehanna valleys, in Pennsylvania, where ore is abundant, the coal near at hand, and the flux on the spot; where the whole land is a garden, and therefore food cheap and plentiful, and the great seaports not far off. For all these considerations, as well as for beauty, size, and convenience of build, and for its historic interest, the Thomas furnaces, which have been selected as illustrative of the American manufacture for this work, stand pre-eminent."

His description of the Thomas works is accompanied with two large folding sheets of drawings of Nos. 1 and 2 furnaces. Dr. Percy reports No. 1 furnace as having made an average of 248 tons 7 cwt. 3 quarters of pig iron per week during a blast of 186 weeks, with a fuel consumption of 1 ton 19 cwt. 3 quarters (4,452 lb.) per ton of pig iron. Henry's "History of the Lehigh Valley" refers to the largest weekly yield of No. 1 furnace, 351½ tons, as being "an amount unprecedented in the annals of iron making."

To show the progress that has been made at the Thomas Iron Co.'s works, we need only say that No. 1 furnace, which was rebuilt in 1894, and equipped with regenerative stoves in 1897, has produced as much as 1,327 tons of iron per week, with fuel consumption for periods of six months of 2,428 pounds, or but a little more than half of the quantity reported by Dr. Percy.

Nos. 2 and 4 furnaces, at Hokendauqua, were abandoned in order that the machinery might be concentrated on the remaining four furnaces. All other furnaces have been enlarged and improved, except Nos. 7 and 8 at Alburtis, which continue to operate on anthracite exclusively. The pig iron from these furnaces is preferred by many of our customers.

Highest and Lowest Prices of Iron.

The first shipment of pig iron from No. 1 furnace was made July 2, 1865, to Butz & Yard, Easton, Pa., grade No. 1 X; price $27 per ton. The highest price received was $75 per ton at the furnace for No. 1 X, on Aug. 20, 1864. On this date, however, gold was selling at 256½ to 257⅛. The lowest price received for No. 1 X was on March 3, 1898, when an order was entered for 300 tons at $10.60 per ton at furnaces. A large tonnage of gray forge and No. 3 foundry was sold during the first half of 1878 at $9 per ton at furnace. The present prices are as follows: $15.00 for No. 1 X; $14.25 for No. 2 X; $13.50 for No. 2 plain; $13.25 for No. 3 foundry, all f. o. b. at furnaces.

The present output of the Richard mine in one year is now as great as it was for the first ten years, from 1856 to 1865, inclusive. The output of the furnaces has increased almost in the same ratio. The total amount of pig iron produced in 50 years is 4,512,030 tons 9 cwt. One year's output at the present time is as great as it was during the first nine years after the furnaces commenced producing. This is due, first, to the greater number of furnaces, and second, to their increased capacity.

Early in recognizing the importance of the chemical laboratory, the company engaged Dr. P. W. Shimer as its first chemist, Nov. 17, 1878, the first laboratory being established at Alburtis. The main laboratory, at Hokendauqua, is a model iron works laboratory, complete in all its equipment, with elaborate arrangements for sampling and crushing ore, including a small Blake ore crusher, drill, lathe, etc., all operated by power. Mr. Clemens C. Jones was chief chemist at Hokendauqua from Sept. 1, 1885, to Nov. 1, 1892, when he resigned, and was succeeded by Walter Wyckoff, the present chief chemist. Mr. Wyckoff entered the laboratory May 20, 1888, as chemist, and has, therefore, been with the company almost 16 years.

There is also a mechanical laboratory, fitted with apparatus for testing materials, including a 100,000-lb. Riehle testing machine. Every car of ore, coke and limestone entering the different works, and every car of pig iron leaving them, is carefully tested by experienced men, and as carefully tested in the chemical laboratory.

In making "Thomas" foundry iron, the ore mixture is maintained as uniform as possible. It is made up approximately of 25 percent Richard, 25 percent other magnetic, 25 percent brown hematite, and 25 percent Lake ore, with occasionally some foreign hematites. Puddle furnace cinder and heating furnace cinder are not and never have been used in the manufacture of "Thomas" iron.

Wide Distribution of Stock.

The number of stockholders at present is 487, made up as follows:

		Shares.
211	men	19,471
193	women	18,183
75	estates and trustees	11,302
8	banks and trust companies	1,044
487	shareholders.	50,000

The stock of the company has never been used for speculative purposes, and is largely held today by the families and descendants of the people who established the company fifty years ago. In fact the personnel of the present board of directors shows that they are descendants or representatives of the original founders of the company.

Joseph S. Rodenbough is the son-in-law of Russell S. Chidsey; William P. Hardenberg is the son-in-law of Benjamin G. Clarke; Fred R. Drake is the grandson of John Drake; J. Samuel Krause is the son of Matthew Krause; William H. Hulick is the son of Derrick Hulick; and Samuel Thomas is himself one of the original founders.

The company has made three issues of bonds during the past fifty years: First, May 21, 1856, $75,000, at 6 percent, to provide funds on account of construction of C. & F. R. R. This issue was paid off at the end of six years, and the mortgage was satisfied of record. Second, July 1, 1875. Authorized issue, $600,000 at 7 percent, of which $537,500 were sold, the balance remaining in the treasury. These bonds were issued to provide for losses sustained through the purchase of the South Mountain Iron Co., Oct. 21, 1872. The failure of this venture was in great part due to the financial panic of 1873. This issue of bonds was paid off at maturity and the mortgage was satisfied of record. Third, July 1, 1890. Authorized issue of $500,000 at 5 percent, of which $350,000 were sold. This was, in fact, not a new loan, but intended to take up and refund in part the 7 percent loan. Some of the bonds were purchased from time to time and cremated, as follows: Jan. 26, 1897, $15,000; June 22, 1898, $5,000; Nov 25, 1898, $42,000. As the issue was subject to call after five years, the remainder, $288,000, was duly and regularly called for payment June 30, 1899. By July 24, 1900, they were all in and were cremated. The mortgage was satisfied of record, since which time there has been no bonded debt.

Stock and Dividends.

The present capital stock is $2,500,000, divided into 50,000 shares, having a par value of $50 per share. The total amount of stock issued for cash is $466,155. The balance, $2,033,845, represents surplus earnings for which stock dividends have been made.

The Lock Ridge, Keystone and Saucon divisions, as well as all sums for improvements and betterments of the plant, have been paid for out of surplus earnings.

In addition to the stock dividends, which amount to 208.16 percent, cash dividends have been paid semi-annually on Feb. 1 and Aug. 1, almost without interruption, and amount to 352.75 percent, making the stock and cash dividends during the past fifty years aggregate 560.91 percent. The first dividend was declared July 27, 1856; the last one was paid Feb. 1, 1904.

During the fifty years of its progress, the company has passed through many anxious periods, and has naturally made mistakes and failures. Investments in coil mines and ore mines did not always turn out profitable, but the good investments have counterbalanced the bad ones; and at the end of the half century the company finds itself in strong financial condition.

The operations of the furnaces have often been interfered with by accidents, short fuel supply, floods, and financial panics. The first serious accident occurred on July 4, 1855, about one month after starting No. 1 furnace, when a fire, caused by some carelessness at the "open front" of the furnace, destroyed the cast-house and hoist tower.

Strikes at the anthracite mines have frequently compelled furnaces to be blown out or banked. The anthracite strike of 1871, which lasted for several months, forced all the furnaces to blow out except No. 2. During the strike which prevailed in the entire anthracite region from May 10 to Oct. 23, 1902, all the furnaces, with one exception, were either banked or blown out.

Vicissitudes of Finance.

Of all the financial panics (1857, 1873, 1893, etc.), through which the company has passed, that of 1857 was perhaps the most trying, since it occurred before the financial credit of the company had become fully established. The effect of this panic was far-reaching. Cash payments were suspended Customers owing large amounts asked for extensions; some settlements were made at 50 percent, while some accounts become a total loss. Heroic measures were necessary to meet the situation. Shipments of pig iron were in a large measure suspended. On Sept. 22, the superintendent was directed to reduce mining operations one-half; ten days later, on Oct. 1, he was ordered to stop mining altogether. On Nov. 5 he was authorized to resume mining in New Jersey, provided he could do so and not use more than $100 per month in currency, the balance to be paid in four months' notes. The men were supplied by the company with provisions, the price of which had greatly advanced. Flour was selling at $15 per barrel, and for one lot of 50 barrels, $16 per barrel was paid.

The minutes show that the directors were frequently called upon by the banks to give their individual endorsement, which was cheerfully done. During the panic of 1857, the following directors and stockholders not only endorsed the paper of the company, but filed with the banks at Easton and Catasauqua, a personal bond guaranteeing its credit: Ch. Aug. Luckenbach, David Thomas, Samuel Thomas, John Brown, Ephraim Marsh, William H. Talcott, Russell S. Chidsey, John T. Knight, John Drake, Derrick Hulick.

During the panic of 1873, due bills, convertible into notes of the company, payable in three months with interest, were authorized. These were used in lieu of cash to carry on the business of the company, as well as to pay the men their wages.

On Nov. 20, 1873, the directors, without security of any kind, gave their individual grauantee for twelve months to the Allentown National Bank to protect the paper offered for discount. The following was the personnel of the board at that time: David Thomas, Samuel Thomas, William W. Marsh, John T. Knight, Charles Stewart, Benjamin G. Clarke, Daniel Runkle.

It will doubtless be a matter of surprise to some of the younger stockholders, as well as of interest to all, to learn that the national tax paid by the company directly to the United States Government on pig iron alone, from July, 1864, to December, 1866, amounted to $200,423.83.

The company has earned and maintained a reputation for high class foundry iron, as well as for basic and mill iron, and points with pride to a record of 50 years during which time it has used all-ore mixtures. It also claims to be the oldest company in America manufacturing pig iron, that has not been reorganized, or had its original corporate name changed.

Analysis of Thomas Iron.

The continued use of brown hematite (limonite) iron ores has been of especial advantage to its mixture, as the use of such ore enables it to control the silicon in the pig iron, and supply its foundry customers with any reasonable percentage of silicon they may require. The composition of standard Thomas irons is shown by the following analyses:

	Silicon %	Sulphur %	Graphitic Carbon %	Combined Carbon %
Special Thomas Scotch	3.50 and over	.01 to .02	3.70	.25
No. 1X Thomas	up to 3.25	.01 to .02	3.70	.25
Thomas Scotch	3.00 to 3.50	.02 to .03	3.60	.30
No. 2X Thomas	up to 3.00	.02 to .03	3.50	.35
No. 2 Soft	2.50 to 3.00	.03 to .04	3.40	.40
No. 2 Plain	2.00 to 2.50	.03 to .05	3.30	.50
No. 3 Foundry	1.50 to 2.00	.04 to .06	3.20	.60
Gray Forge	.75 to 1.50	.06 to .10	3.00	.80
Basic	under 1.00	under .05		
Phosphorus	.60% to .90%	Manganese	.40% to .75%	

The company has endeavored to progress with the times, and further improvements at the furnaces are contemplated. An order has just been placed for two pairs of modern, compound blowing-engines for furnaces Nos. 1 and 3 at Hokendauqua, each capable of blowing 40,000 cubic feet of air per minute, under a pressure of 25 pounds, which will enable the company to increase greatly the output of these two furnaces.

The capital stock is $2,500,000. The company has no bonds, is entirely free from debt, and has a large surplus.

The Keystone Slag Co., of Reading, Pa., recently formed to manufacture the slag of the Reading Iron Co.'s furnaces, has its plant about completed and early in June will be manufacturing clean slag in commercial sizes from sand roofing and grit up to the concrete sizes. The capital is $20,000. A considerable part of the prospective output for 1904 has been disposed of.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Briggs-Weaver Machinery Co., Dallas, Texas, has been incorporated with $150,000 capital to deal in machinery. C. H. Briggs, J. C. Weaver and J. E. Thatcher are the incorporators.

The Buckeye Brass & Iron Co., of Cleveland, has been incorporated with $10,000 capital. M. J. Pelton, J. D. Pelton, S. F. Cheyel, W. P. Trinter and F. S. Chamberlain are the incorporators.

The Armac Motor Co., of St. Paul, has incorporated with $20,000 capital to engage in the manufacture of motors. E. W. Keller, A. J. McCollum and H. D. Wheeler are the incorporators.

The Kelly & James Co., of Pittsburg, started its malleable iron foundry at Greensburg, Pa., on May 19. About 500 men are employed.

The United States Furnace & Foundry Co., chartered in West Virginia, has decided to locate at New Kensington, Pa., citizens having subscribed $6,000 worth of stock. The abandoned Bradley stove foundry has been purchased for $27,000. The company will manufacture hot air furnaces and sanitary closets.

Monks, Hall & Co., Warrington, Eng., write us that they are in the market for a machine for making automatically cup square carriage bolts from ¼ to ½ inch. The machine desired is a double-blow cold heading machine.

The Erie Stove & Mfg. Co., of Erie, Pa., has completed its plant and will start up early in June. The greater part of the machinery is on the ground. The company will manufacture a line of gas heaters, ranges, water heaters and gas appliances. One product is a new sectional burner for natural gas, on which a patent has been applied for.

The Free-Piston Gas Engine Co., Detroit, has been incorporated with $125,000 capital to manufacture gas engines. George Maitland, Henry C. Hart, Charles F. Burton and E. J. Stoddard are the incorporators.

The Ohio Pump Co., Port Clinton, O., has been incorporated with $10,000 capital to engage in the manufacture of pumps.

The Elkhart Bridge & Iron Co., Elkhart, Ind., has been incorporated with $10,000 capital to engage in the fitting and erection of structural steel. George Berkey, Frank Brumbaugh and Fred Fahlgren are the incorporators.

The Cahill Mfg. Co., Worcester, Mass., has been incorporated with $20,000 capital to engage in the manufacture of brass and other metals. J. P. J. Cahill is president and treasurer.

The Seamless Rolled Steel Pipe Co., Philadelphia, has been incorporated with $2,000,000 capital to engage in the manufacture of a seamless steel pipe. J. I. Wood, B. M. Addis and E. L. Bodin are the incorporators.

The Cumberland Foundry & Mfg. Co., Nashville, Tenn., has increased its capital from $10,000 to $50,000.

The Star Automobile Co. has been incorporated at Buffalo, N. Y., with $10,000 capital by D. R. Driscoll, C. E. Chalmers and Daniel Burgomaster.

The Cataract Electric Supply Co., Buffalo, N. Y., capitalized at $100,000, has been incorporated. The directors are: Nelson S. Hallett, Francis T. McDonald, Edwin B. Collister, Arthur R. Jenkins and Harry B. Lamson, of Buffalo.

New Construction:—

Gohmann Bros. & Kahler, New Albany, Ind., have increased their capital from $10,000 to $25,000, to provide funds for the erection of an addition to their foundry.

The Kenton Gas Engine Co., Kenton, O., will erect an entirely new plant for the manufacture of its gas engines.

The Standard Stove Works, Fort Payne, Ala., has negotiations on for the removal of its foundry to Columbus, Miss. If the negotiations with the latter town fail, the plant will be removed to Birmingham.

The LeRoy Plow Co., LeRoy, N. Y., which last year rebuilt its plant on a much larger scale than before its fire, has found it necessary to increase its capacity still further and has broken ground for additional buildings.

The Pittsburg and Valley Districts:—

The plant of the Wheeling Mold & Foundry Co., Wheeling, W. Va., is being considerably enlarged in order to provide sufficient capacity to take care of the New York tunnel castings, the contract calling for the delivery of 32,000 tons during the next eighteen months. The main building is being extended 40 feet, and a 60-foot lean is also being added. A narrow-gauge track is also being laid to facilitate the handling of iron and coke.

The Liggett Spring & Axle Co., with works at Monongahela, Pa., has opened offices in rooms 905 and 906, Park building, Pittsburg. The new plant which this company recently built at Monongahela for the manufacture of springs and axles is now in full operation.

The Mesta Machine Co., Pittsburg, has opened an Eastern office at 714 Singer building, New York, with John A. Schroeder in charge.

The Youngstown Mfg. Co., Youngstown, O., has surrendered its charter and has been dissolved. This company has been succeeded by the Youngstown Bolt Co.

The Reliance Tube Co., of Pittsburg, has placed the contracts for its tube making machinery with the United Engineering & Foundry Co., of the same place, for its new boiler tube plant to be built near Avenue, Pa.

The Oscar Daniels Co., of Chicago, has been awarded the contract for the erection of the structural steel work for the 38 warehouses to be erected on the South Side, Pittsburg, by the Pittsburg Terminal Warehouse and Transfer Co. The Jones & Laughlin Steel Co. will furnish the steel. About 12,000 tons of material will be required. Work on the erection of these warehouses will be commenced immediately.

A shipment of 800 tons of finished material was made one day last week from the Aetna-Standard plant of the American Sheet & Tin Plate Co., Martins Ferry, O., breaking all previous records.

The Penn Bridge Co., Beaver Falls, Pa., has been awarded the contract for the erection of a 350 foot bridge at Sharon, Pa. Abou 2,000 tons of steel will be required.

The Bessemer plant of the Republic Iron & Steel Co., Youngstown, O., resumed operations this week after an idleness of one week. The Hannah furnace of this company has been banked.

The Ohio plant of the Carnegie Steel Co., Youngstown, O., is on in all departments this week.

The bursting of the air pipes leading from the new condensing plant of the Isabella furnaces of the Carnegie Steel Co., Pittsburg, to No. 1 furnace, partly wrecked the condensing room. At this plant the moisture in the air is condensed before entering the blast furnaces, and the operation is being watched with much interest by blast furnace operators all over the country.

United States Realty & Construction Co.

A plan for the reorganization of the United States Realty & Construction Co., of New York, is now being submitted to the stockholders by a committee consisting of James Stillman, P. A. Valentine, O. T. Bannard, S. S. Palmer and James H. Post. It provides for the incorporation of the company under the laws of New Jersey with a capital of $30,000,000, made up of 300,000 shares of the par value of $100 each. Bonds to the value of $13,506,000 bearing 5 percent interest are to be issued, payable in 20 years. To the holders of the preferred stock of the company is offered one-twentieth of one of the bonds, having a par value of $1,000 and eighty-five two hundreths of a share of the new stock; to the holders of the common stock is offered 15-100 of a share of the new stock for each share of common. Arrangements for the deposit of the common and preferred stock for the purpose of making the exchange have been made with the New York Security & Trust Co., of New York, and the Illinois Trust & Savings Bank, of Chicago.

The Perkins Machine Co.'s main office is removed to the Warren plant at Warren, Mass., and all communications should be addressed to that point.

DRY STEAM
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Your steam piping has been well designed and correctly proportioned—it is free from pockets and unnecessary bends, and expansion and contraction strains have been provided for—but, still it will pay you well to install Cochrane Steam Separators in your steam line.

There's the economy of delivering dry steam to the engines—which means taking out the condensation that occurs in the piping.

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We will gladly send you full particulars if you are interested

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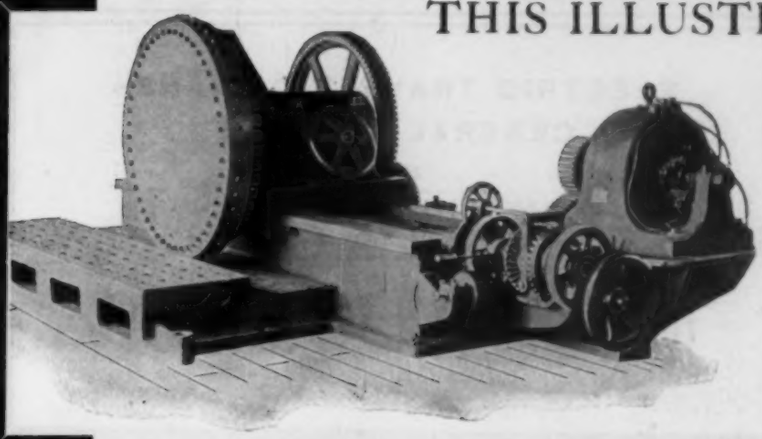

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equipped with motor drive.

This machine is built with various sizes of cutter head and has cutting travel varying from 8 feet to 20 feet.

This planer has all of the latest improvements including quick return of cutter head, two changes of feed in either direction and gears all cut from the solid.

The adjustment of cutter head is by hand wheel shown at the right of carriage. Worm gearing is entirely dispensed with in the driving mechanism of this machine.

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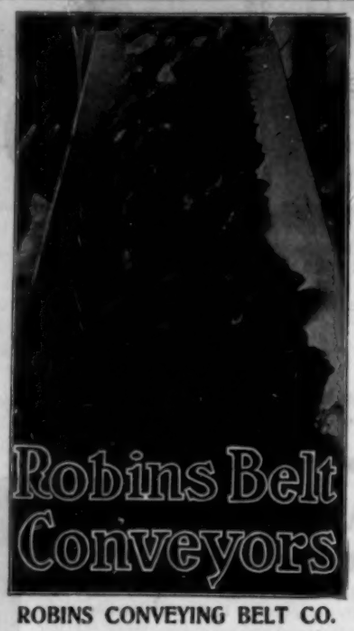

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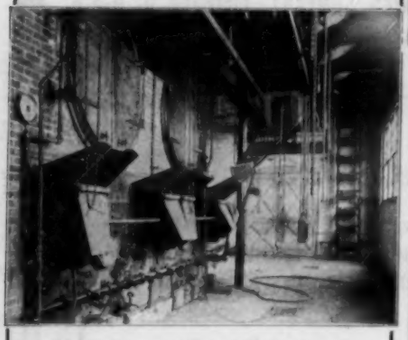

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